MP 555 GPS

AT Command Reference

2130335
Rev 3.0

SIERRA WIRELESS
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5,845,216	5,847,553	5,878,234	5,890,057	5,929,815
6,169,884	6,191,741	6,199,168	6,327,154	6,339,405
6,359,591	6,400,336	6,643,501	6,516,204	6,561,851
6,653,979	6,697,030	6,712,627,	6.785,830	D367,062
D372,248	D372,701	D416,857	D442,170	D452,495
D452,496	D453,733	D459,303	D496,642	D496,655

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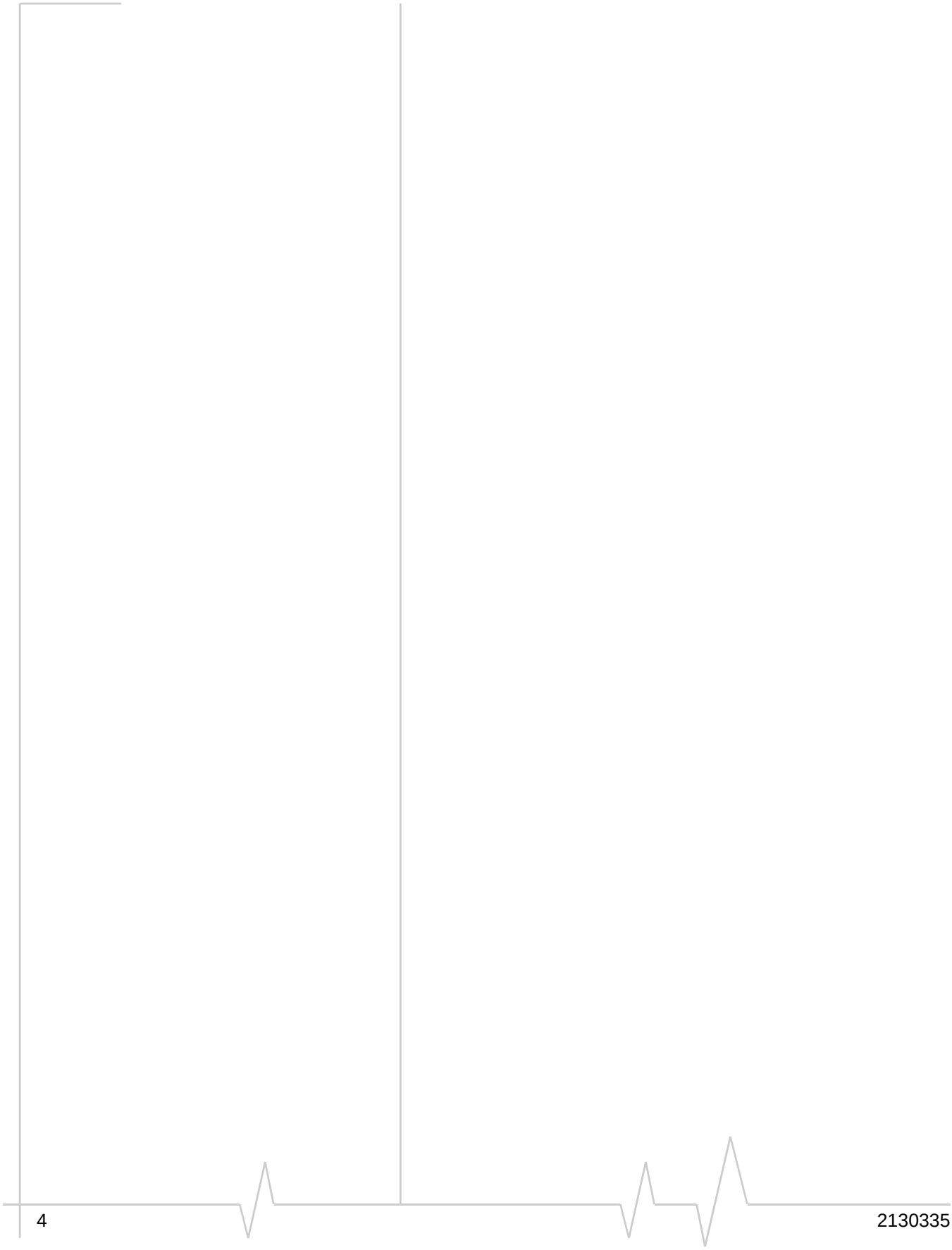

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1: About This Guide

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- Introduction
- References
- Currency
- Document structure
- Conventions

Introduction

This reference details the Attention (AT) command set supported by the Sierra Wireless MP 555 GPS rugged wireless modem.

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 on Modem Basics covering these issues and other important connection details.

You should be familiar with the use of AT commands with standard wireline modems to use this document.

The Sierra Wireless CDMA2000 1X products present two methods of controlling the modem: through AT commands or through a proprietary interface using our SDK (Software Development Kit). Some features or capabilities of the modem require the use of the SDK. This document presumes that the AT interface is the only interface available to you; features requiring the SDK are not discussed. (For more information regarding the SDK, see the Developer's Central web site: www.sierrawireless.com/developers/default.asp.)

Note: The Sierra Wireless CDMA products support a user locking mechanism (similar to a PIN). 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 Sierra Wireless MP 555 GPS, and does not deal with operational use guides. Please consult the individual product manuals for guidance.

Not all commands include detailed descriptions. Commands are implemented to be compliant with industry standards and reference is often made to the following standards:

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

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

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Global Engineering operates offices around the world. Consult the web site above for locations.

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

Terminology and acronyms

This document makes wide use of acronyms that are in common use in data communications and cellular technology. Our Internet site provides a Glossary (document #2110032) that may be helpful in understanding some acronyms and terminology used in this guide.

Currency

This document is current with version 2.x of the MP firmware. You can determine your firmware version using the AT command, !MPGVER?. See page 48.

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 CDMA2000 1X products. 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 is 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 exisits to perform a desired function, there are tables organizing the commands into these groups:

- Basic modem operation—commands that make the modem execute an immediate action, such as dialing, or restoring settings
- Basic modem configuration—settings governing the modem's behaviour when executing basic operations
- Device and service interrogation—commands to determine the services available, information about and the status of the modem
- SMS management—commands to check, receive, and delete, incoming messages, and to originate outgoing messages

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

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

Conventions

The following format conventions are used in this reference:

Character codes or keystrokes which 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.

See page 24 for a discussion of how the modem frames these two elements.

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

```
CONNECT 14400
```

2: Modem Basics

2

- CDMA basics
- Establishing a communication session
- Modes, states, and conditions
- State transitions
- Modem buffers
- Command handling
- Responses and result codes
- Response and result framing

CDMA basics

To understand the call connection process in CDMA modems, a basic knowledge of the CDMA network helps. There are two primary services available over CDMA2000 1X:

- IS-95, a circuit switched type of connection; and
- 1xRTT, 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-95

All Sierra Wireless CDMA products are capable of making connections in IS-95.

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.

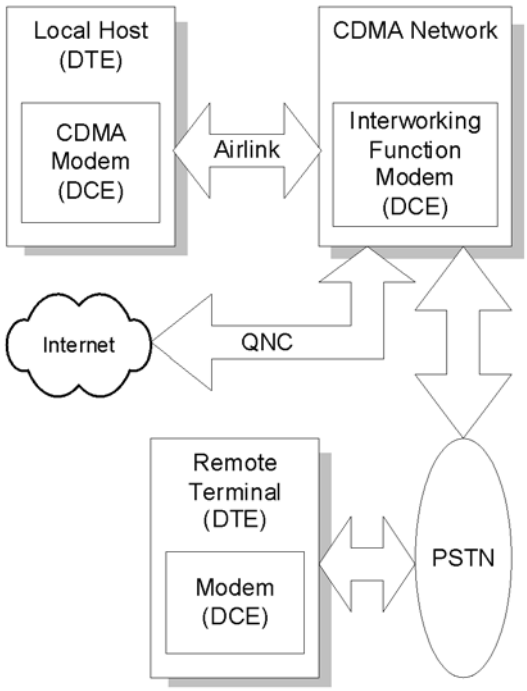


Figure 2-1: CDMA IS-95 call connection block diagram

Note: When using IS-95, there is special handling of AT commands. Consult Appendix A for a detailed explanation.

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.

CDMA2000 1X

The MP 555 GPS provides support for CDMA2000 1X (1XRTT) technology. The connection can be thought of as “always on” and only actively used when there is packet data to send or receive.

CDMA2000 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 CDMA2000 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 on the downlink (network to modem) and 76.8 kbps on the uplink (modem to network).

Establishing a communication session

Any terminal emulation program can be used to create a communications session that will allow you to issue AT commands to the MP 555 GPS. This section describes how to use HyperTerminal, a program typically installed with Windows, to establish a session with the MP 555 GPS.

To establish the communications session:

1. If the modem is not already connected to a serial port on your computer, connect it.
2. If open, close Watcher (or any other program that communicates with the modem).
3. Launch HyperTerminal. (Depending on your version of Windows and how it was installed, you can launch the program by selecting **Start > Programs > Accessories > Communications > HyperTerminal**.)
4. Enter any name and select any icon in the Connection Description window and click **OK**.
5. Select the COM port to which the modem is connected (usually **COM1**) in the **Connect using** field, and click **OK**.
6. Select these port settings:
   - **Bits per second** 115,200
   - **Data bits** 8
   - **Parity** None
   - **Stop bits** 1
   - **Flow control** Hardware

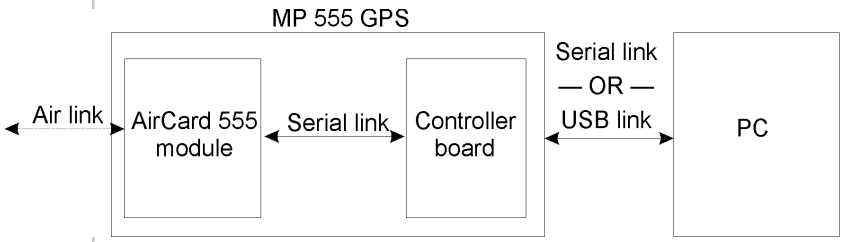
   Click **OK**.

To verify that the communications session is functional, enter **AT**. The modem should respond with OK. (If the echo is off, your command is not displayed. Enter **ATE1** to turn the echo on.)

Host connection basics

Hardware structure

The MP 555 GPS has two main components: the AirCard® 555 wireless network card and the controller board. Each of these components has its own firmware (resident software). There is a serial link between the AirCard 555 and the controller board.

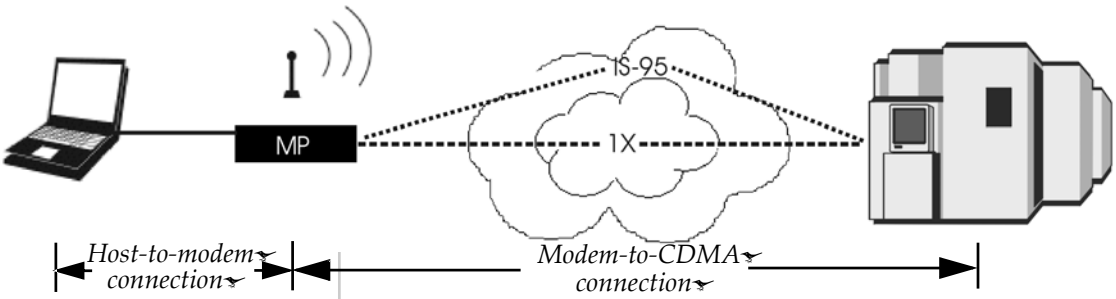


All AT commands that begin with **AT!MP** are handled by the controller board and all others are handled by the AirCard 555.

It is important to recognize these two command types because during *modem-to-CDMA* connections, the MP 555 GPS does not respond to AirCard AT commands. (That is, only **AT!MP** commands will work.) This means that it is not possible to, for example, check the signal strength using the command **AT!RSSI?** during a *modem-to-CDMA* connection.

Host and network connections

When the MP 555 GPS is used to access Internet services or retrieve data over a VPN connection, two connections are required: the *host-to-modem* connection and the *modem-to-CDMA* connection.



Modem-to-CDMA connection

Note: If you are developing a network application to control or monitor MP 555 GPS modems installed in a fleet of vehicles, it is usually best to use Always On mode. (With On Demand mode, it can be difficult to track the modems' IP addresses.)

The operating mode determines how the *modem-to-CDMA* connection is established. In **Always On** mode, the *modem-to-CDMA* connection is established whenever the modem is powered and CDMA2000 1X service is available. In **On Demand** mode, the *modem-to-CDMA* connection is established only when the *host-to-modem* connection is requested.

Regardless of the operating mode, the *modem-to-CDMA* connection is established as needed, if the modem has been configured to send MTP data. (See the **AT!MPMTCONF** command on page 48.)

Host-to-modem connection

Note: The AT command **AT!MPOPMODE** *is used to set the operating mode.*

The MP 555 GPS supports serial and USB host connections. To issue AT commands to the modem, the serial connection is required. Having a USB connection in addition to the serial connection has two main advantages:

- USB provides a higher data rate between the host and the modem
- With a USB connection, the modem connects instantly to the network on startup. With only a serial connection, you must establish the connection using Watcher or Windows DUN (Dial-Up Networking.) With a USB host connection, and the operating mode set to **Always On**, it is not necessary to run Watcher or DUN to make connections.

If you intend to have both a serial and USB connection, you must install the modem using the USB option. (When you install the modem software, you are prompted to indicate whether you are using a serial or USB connection. When you select the USB option, both the serial and USB drivers are installed.) If you install the modem using the serial option and then connect a USB cable, the host computer will not be able to communicate with the modem.

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 CDMA2000 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. All CDMA modems are capable of this 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 on all CDMA products in IS-95 coverage.

The MP 555 GPS also supports data connections using 1xRTT 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

The “mode” is used to describe the purpose of the connection: data, fax, or voice. The MP 555 GPS supports only data mode.

States

The modem’s state, in conjunction with its condition, will govern how the modem handles traffic to and from the host (DTE) and to and from a remote modem.

Three states are supported:

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.

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 1xRTT packet connections.

Data

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

Conditions

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

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 through the modem between the host (DTE) and the remote terminal or network.
- In passthrough state (IS-95), 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 establishing a connection (or answering a data 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 or there may be some data lost.

Data to command state

The modem changes from data to command state when:

- The DTR de-asserts (depending on settings made with **&D1** or **&D2**).
- The modem is reset or power-cycled.
- If there is an active PAD (Packet Assembler/Disassembler) session and the PAD is configured to use TIES (Time Independent Escape Sequence), the modem switches to command state on receipt of "**AT+++**". (The "AT" must be in upper case.) The command **!MPPADCONF** (described on page 50) is used to enable and disable TIES.

When the modem changes to command state, it will issue an OK result. 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.

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 will buffer the input from the host until a <CR> is entered. The buffered data can be edited using the backspace <BS>. Depending on the product, the modem (with Echo enabled) may echo the sequence <BS><space><BS> for human readability.

There is a limit of 200 characters to one command line, excluding the **AT** prefix and the **<CR>** termination. If the command buffer length is exceeded the modem will continue 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> will 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 will not require you to adjust these settings.

Data flow control The modem's CTS and RTS lines control data flow. Where large amounts of data are being exchanged, local hardware flow control must be used to prevent buffer overflows—it is required for PPP connections. Hardware flow control is enabled by default. (See the **+IPR** command on page 66.)

Command handling

AT can be issued as a command without parameters. It acts like a "ping" to the modem and will always give a result code of "OK". If there is no response from the modem, try issuing **ATQ0** (Quiet mode off).

Commands may be entered in upper or lower case.

Concatenation

Note: When concatenated together, AT commands may not function predictably. It is best to avoid concatenating commands without first testing and verifying the results.

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. Allowed values are specified.

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

In this reference, optional parameters are enclosed in square brackets (**[ ]**). Some commands have more than one optional parameters, such as:

+MV18S=[m],[ans],[fb]

None of the parameters, **<m>**, **<ans>**, or **<fb>**, are required, as indicated by the brackets. To issue this command, specifying a value of "1" for **<fb>**, and without specifying values for **<m>** and **<ans>**, you would enter:

AT+MV18S=,,1

Two commas are required before the **<fb>** parameter because otherwise the "1" would be used as the value for **<m>** or **<ans>**.

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

Defaults shown in the command tables are those for the factory settings of the modem. They are *not* the defaults assumed for a command issued without parameters, which are noted in the text.

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.

The table for S registers indicates the standard default values. The factory defaults are also noted in a separate sub-section.

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 will be returned if the command is not recognized, or the command is not permitted in the current mode, state, or condition of the modem.

See the table on page 74 for a listing of result codes.

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**) causes the modem to echo characters received from the host back to it while in command state. The backspace is echoed as <BS> <space> <BS> in order to erase the last character.
- Quiet off (**Q0**) enables the modem to issue result codes following commands. Quiet on (**Q1**) suppresses result codes entirely; responses remain unaffected.
- Verbose result codes enabled (**V1**) 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 using software.)

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**).

Response and result framing

Depending on the modem configuration, modem responses and result codes are framed, typically with the <CR> and <LF> characters.

If you are designing or customizing software that will interface with the modem using AT commands, it is necessary to understand how the modem frames its responses and result codes.

Framing Characters The modem frames its replies with carriage return and line feed characters as they are defined in registers **S3** and **S4** respectively. These are normally the ASCII value 13 for carriage return (<CR>) and 10 for line feed (<LF>). (The following discussion assumes that <CR> and <LF> are used.)

Response framing

Regardless of how the modem is configured, responses to commands are in the form of ASCII text with a trailing <CR><LF>. Where a response has more than one line, each line is terminated with a <CR><LF>.

When the Verbose setting is on (**ATV1**, see page 72) each response has a leading <CR><LF>. If Verbose is off (**ATV0**), there are no leading characters prior to the first line of response.

The setting of Quiet (**ATQ**, see page 71) has no impact on responses.

Result code framing

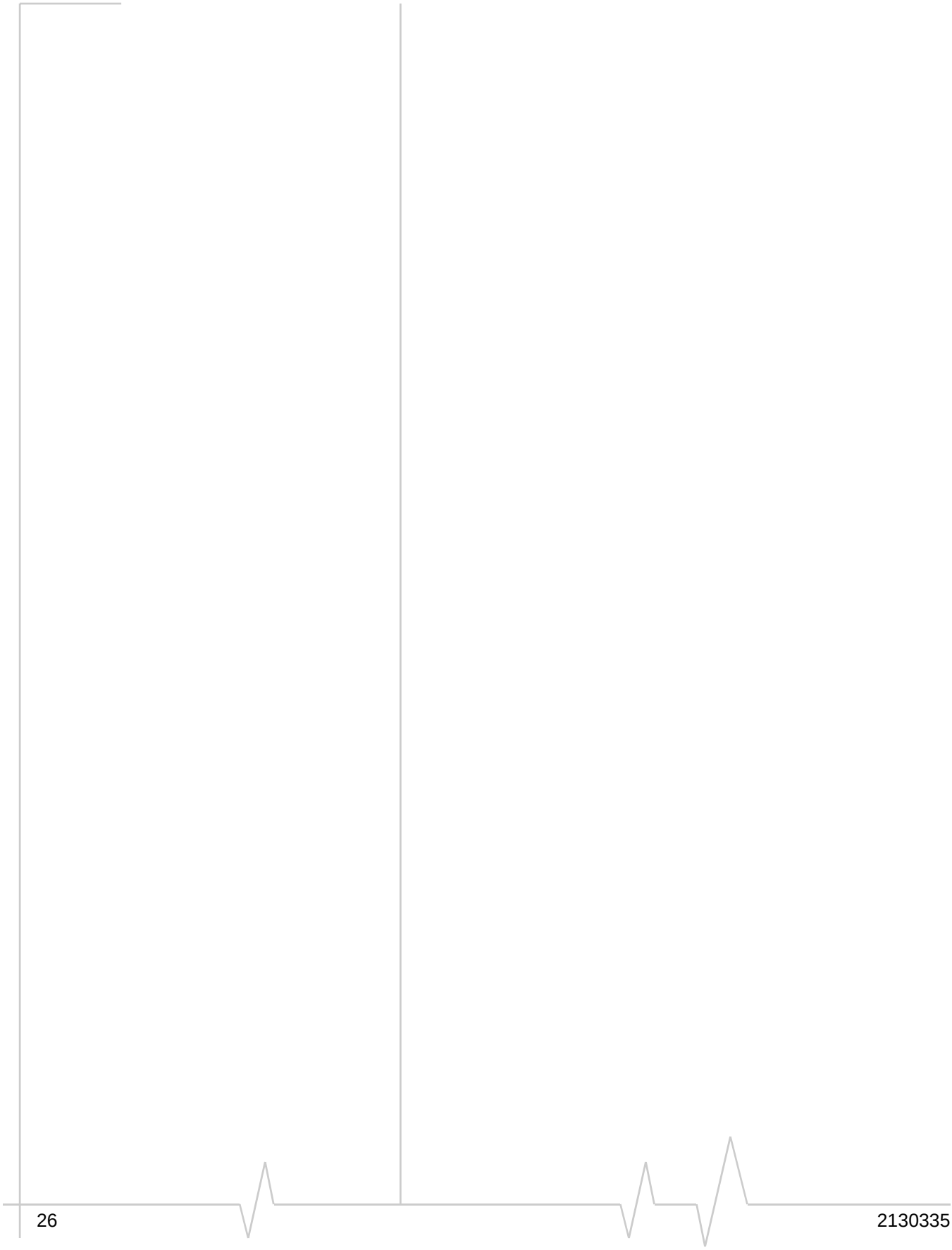
Every command will return a result code unless the Quiet command is enabled. If Quiet is on (**ATQ1**, see page 71) then neither framing characters nor result code is returned.

A leading <CR><LF> is inserted ahead of the result code if Verbose is on (**ATV1**, see page 72). 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. For example, the result code OK appears as:

- <CR><LF>OK<CR><LF>
  if verbose is on (**ATV1**)
- 0<CR>
  if verbose is off (**ATV0**)

When **ATV1** is set and there is an error, <CR><LF>ERROR<CR><LF> is sent to the host computer and no subsequent commands in the command line are processed. If **ATV0** is set, result code 4<CR> is sent instead.

The ERROR (or 4) response may be replaced by +CME ERROR: <err> when the command is not processed because of a radio connection error.



3: Commands

- AT command set summary
- Reference tables
- Status registers
- Result codes
- Stored profile settings

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 3-1: Basic modem operation actions

Cmnd	Pg	Description
&F	58	Factory Settings Restore
&V	58	View Configuration
A/	69	Repeat last command (re-execute the line in the command buffer)
D	69	Dial
H	70	Hook Control
O	71	Online (Remote)
Z	72	Profile Restore

Basic modem configuration

Table 3-2: Basic modem configuration

Cmnd	Pg	Description
!MPAIN	33	Report the state of the specified analog input channel
!MPAINCFG	33	Analog input channel configuration
!MPAUTHPPP	34	Enable / disable PPP authentication between the modem and the host PC
!MPBARSVC	35	Bar services
!MPCLIENTIP	35	Report the IP address
!MPCONFSNAP	35	Configure UDP port number
!MPCONREJ	36	Enable/disable reset feature
!MPCWINFO	36	Reset/Display Connection Watchdog statistics
!MPCWSETUP	37	Set Connection Watchdog
!MPDIO	39	Set the value at a specified digital IO channel
!MPDIOCFG	40	Digital I/O channel configuration
!MPFBKEND	41	Set response to CDMA2000 1X re-acquisition
!MPFBSETUP	41	Configure the Fallback connection
!MPFBTIME	42	Set Fallback timer
!MPGCCLR	42	Clear crash dump data
!MPGCDUMP	42	Read crash dump data
!MPGPSCMD	42	Send TAIP command to GPS module
!MPGPSCOMOUT	42	Enable GPS output to the AT command port
!MPGPSDATA	43	Report current GPS data
!MPGPSESC	44	Set method of escaping from GPS output mode to AT command mode
!MPGPSINIT	45	Set initialization string
!MPGPSINTSET	45	Set GPS update interval
!MPGPSNMEA	45	Set NMEA messages
!MPGPSRESET	46	Reset GPS module

Table 3-2: Basic modem configuration (cont.)

Cmnd	Pg	Description
!MPGPSST	46	Request GPS status
!MPGPSSTOR	47	Enable / disable storing and forwarding of GPS records
!MPGRESET	48	Reset the MP and the PC Card module
!MPGVER	48	Query current firmware revision
!MPIDTIME	48	Sets the inactivity timeout
!MPIGNSENSE	48	Report ignition status
!MPMTCONF	48	Configure MT protocol
!MPNVDEF	49	Set modem configuration parameters to defaults
!MPOPMODE	50	Select operating mode
!MPPADCONF	50	PAD configuration
!MPPADCONN	52	Establish PAD connection
!MPPADSETUP	52	Set up a PAD connection
!MPPDDELAY	53	Set power down timer
!MPPRIVIP	53	Set the private IP address
!MPSETDFLT	54	Set the default connection profile
!MPSETUP	54	Configure a connection profile
!MPUSB	55	Enable / disable USB operation
&C	58	Data Carrier Detect Control
&D	58	Data Terminal Ready Options
+ATINIT	59	AT Initialization
+ATINITSTATE	60	AT Initialization State
+CFG	61	Configuration String
+CMUX	62	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	64	Cellular Extension

Table 3-2: Basic modem configuration (cont.)

Cmnd	Pg	Description
+ICF	66	Character Framing
+ILRR	66	Local Rate Reporting
+IPR	66	Fixed Port (R_m) Rate
+MA	67	Modulation Automode
+MR	67	Modulation Reporting
+MS	67	Modulation Selection
+MV18R	67	V.18 Reporting
+MV18S	68	V.18 Selection
E	70	Echo (Command State)
L	70	Loudness (Speaker Volume)
M	71	Mute (Speaker Control)
P	71	Pulse Dialing
Q	71	Quiet—Result Code Display Option
S	71	S-Register Read and Write
T	72	Tone Dialing
V	72	Verbose—Result Code Form
X	72	Result Code/Call Progress Control

Device and service interrogation

Table 3-3: Device/Service interrogation commands

Cmnd	Pg	Description
!RSSI	55	Received Signal Strength Indication
!STATUS	56	Modem status report
+CAD?	60	Analog or Digital Service (Read-only) (local only)
+CBC?	60	Battery Charge (Read-only) (local only)
+CBIP?	60	Base Station IP Address (Read-only)
+CGMI	61	Get IWF Manufacturer
+CGMM	61	Get IWF Model
+CGMR	61	Get IWF Revision

Table 3-3: Device/Service interrogation commands

Cmnd	Pg	Description
+CGSN	61	Get IWF ESN
+CMIP?	61	Mobile Station IP Address (Read-only)
+CSQ?	63	Signal Quality (Read-only)
+CSS?	63	Serving System (Read-only)
+GCAP	65	Get Capabilities
+GMI	65	Get Manufacturer
+GMM	65	Get Model Number
+GMR	65	Get Revision
+GSN	65	Get ESN
S	71	S-Register Read

SMS messages

Table 3-4: SMS operations

Cmnd	Pg	Description
!CNTSMS	32	Count of SMS messages in the modem
!DASMS	32	Delete All SMS messages
!DSMS	32	Delete SMS message (selective)
!GSMS	33	Get SMS message from the modem
!SSMS	55	Send SMS

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 on page 74.

! Prefix

Table 3-5: ! Prefix commands

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> (not supported) 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 0, so the highest message number in any list is the reported count minus one.
!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 (see **!CNTSMS** for the definitions of the SMS index lists). Parm Meaning i message list (index 1, 2, 3, or 4) m message number (base 0) The message number is a base 0 index into the list, where **0** is the oldest message, and the number reported by **!CNTSMS** minus one, is the most recent message. If the message number parameter is omitted, then all messages in the specified index list are deleted. Normally messages are only deleted from list 3 (old).

Table 3-5: ! Prefix commands (cont.)

Command	Description
!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, 3, or 4) m message number (base 0) The message number is a base 0 index into the list, where **0** is the oldest message, and the number reported by **!CNTSMS** minus one, is the most recent message. After a new message is read, it is placed in message list index 3 (old messages).
!MPAIN?<chan>, <scale>	**Report the state of the specified analog input channel** The MP 555 GPS has four analog input channels, allowing analog sensors and gauges to be connected to the modem. These must be connected to the appropriate pins of the DB15 I/O connector. (See the *Software Installation, Configuration, and Integration Guide* on the MP 555 GPS installation CD for more information about configuring I/O devices.) The channels correspond to the pins as follows: • **<chan>=1** Analog input 1—Pin 14 • **<chan>=2** Analog input 2—Pin 7 • **<chan>=3** Analog input 3—Pin 15 • **<chan>=4** Analog input 4—Pin 8 Channels 5, 7, and 8, correspond to test points in the modem. The voltage at these points is measured for diagnostic purposes. Channel 6 reports the battery voltage. Watcher uses this to control the low-battery indicator and display warning messages. The **<scale>** value determines how the state is reported: • **<scale>=0** Reports the raw value (0 to 1023) • **<scale>=1** Reports the scaled value (See **!MPAINCFG**.)
!MPAINCFG= <chan>,"<input label>", "<unit label>",<zero scale>,<full scale> **!MPAINCFG?= <chan>**	**Analog input channel configuration** Sets the labels and the scale for the specified input channel. **Parameter settings** The supported values are: • Channel **<chan>=** 1 Analog input 1 2 Analog input 2 3 Analog input 3 4 Analog input 4 Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPAINCFG (continued)	**Parameter settings (continued)** • Sensor or gauge description **<input label>=** 20 character string • Name of units **<unit label>=** 20 character string • Minimum value **<zero scale>=** 0 to 65535 (Must be less than <full scale>) • Maximum value **<full scale>=** 0 to 65535 (Must be greater than <zero scale>) **!MPAINCFG?** returns the configuration parameter values for the specified channel.
!MPAUTHPPP=<n> **!MPAUTHPPP?**	**Enable / disable PPP authentication between the modem and the host PC** *Note: This command is only available on modems with firmware version 2.0 or greater.* Controls whether PPP authentication is used in the modem-to-host PC link. (This command has no effect on the link between the MP and the embedded AirCard, over which PPP authentication is always used.) The <n> parameter has these settings: • **<n>=1** Enables PPP authentication • **<n>=0** Disables PPP authentication between the modem and the host PC (default) Disabling PPP authentication allows you to use a single dial-up PPP connection on multiple modems with different CDMA profiles. **!MPAUTHPPP?** returns the current setting.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPBARSVC= <value> **!MPBARSVC?**	**Bar services** Controls the type of connections (CDMA2000 1X or dial-up) that can be made by the modem. (See **!MPFBSETUP** for a discussion of dial-up connections and the Fallback feature.) The **<value>** parameter has these settings: • **<value>=0** **No services barred**—CDMA2000 1X connections are available; where there is no CDMA2000 1X service, the modem attempts a Fallback dial-up connection. (The Fallback connection must be set up using **!MPFBSETUP**.) (This is the default.) • **<value>=1** **All services barred**—No connections are available. • **<value>=2** **Fallback connections barred**—CDMA2000 1X connections are available; the Fallback connection is never attempted. • **<value>=3** **CDMA2000 1X connections barred**—Any attempt to establish a connection invokes the Fallback connection. **!MPBARSVC?** returns the current setting.
!MPCLIENTIP?	**Report the IP address** Returns the client IP address assigned to the modem by the network. If there is no network connection, 0.0.0.0 is returned.
!MPCONFSNAP= <rnapport>, <rawgpsport>, <vpnflag> **!MPCONFSNAP?**	**Configure UDP port number** *Note: This command is only available on MP 555 GPS modems with firmware version R2_1_11ap or later. The <vpnflag> parameter is only supported with firmware version R2_1_12ap or later.* Sets the port number on which the MP 555 GPS receives RNAP/UDP or raw-GPS/UDP packets and sets the VPN support flag. The parameters are: • **<rnapport>** The UDP port number used to listen for RNAP packets (1 - 65535). • **<rawgpsport>** The UDP port number used to listen for raw GPS (TAIP) messages (1 - 65535). • **<vpnflag>** Determines how RNAP data is routed. When disabled (**<vpnflag>=0**), RNAP data is encapsulated in UDP packets and sent to the GSM network. When enabled (**<vpnflag>=1**), RNAP data is sent to the host PC, so that it can be routed through a VPN client. The **!MPMTCONF** command sets whether raw GPS data or MTP data is sent. (The <ctype> parameter is used to make the setting. See page 35.) !MPCONFSNAP? returns the current ports.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPCONREJ=<max connect failures> **!MPCONREJ?**	**Enable/disable reset feature** *Note: This command is only available on MP 555 GPS modems with firmware version R2_1_11ap or later.* Enables and disables the feature that resets the modem after repeated connection attempts fail. The parameter **<max connect failures>** sets the number of consecutive connection attempt failures after which the MP 555 GPS gracefully shuts down, resetting the radio component. If the parameter is set to 0, the feature is disabled. (It is disabled by default.) As an example, the command **AT!MPCONREJ=3** configures the modem to automatically reset the radio component if three consecutive connection attempts fail. **!MPCONREJ?** returns the current setting.
!MPCWINFO=<reset> **!MPCWINFO?**	**Reset/Display Connection Watchdog statistics** *Note: This command is only available on MP 555 GPS modems with firmware version R2_1_11ap or later.* Displays and resets values related to the Connection Watchdog. (The Connection Watchdog is enabled, disabled, and configured with the command **!MPCWSETUP**. See page 37.) **Parameter settings** The only supported value for the **<reset>** parameter is “1”, which causes a reset of the following statistics stored in non-volatile RAM: • **DNS checks** Number of times the modem verifies the DNS server • **CW-trig disconnect** Number of disconnections triggered by the Connection Watchdog • **CW-trig reset** Number of resets triggered by the Connection Watchdog. (The resets occur after a specified number of terminated connections.) **!MPCWINFO?** returns the current statistics.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPCWSETUP= <rxtime>, <dnstime>, <dnsport#>, <dnsname>, <AC Reset Flag>, <PING IP>, <mode>	**Set Connection Watchdog** *Note: This command is only available on MP 555 GPS modems with firmware version R2_1_11ap or later.* The Connection Watchdog monitors connections to determine whether the modem is receiving any data. If the modem is not receiving data, the Connection Watchdog either sends a DNS query to the DNS server or pings a specified IP address, depending on how the feature is configured. If data transmission is resumed following the DNS query or ping, the modem maintains the connection. Otherwise the modem terminates the connection. If the modem is in "always-on" mode, the modem attempts reconnection once the connection is terminated. (See **!MPOPMODE** on page 50.) This command also allows you to set the modem to either disconnect the data connection or reset the radio component whenever the Connection Watchdog has detected an invalid data connection. When a new connection is established, the modem verifies that the DNS server is valid or that pings are possible (depending on the **<mode>** setting), before the modem begins monitoring for data receipt. If the modem is unable to verify the DNS server or the ping fails, the Connection Watchdog remains inactive, but the modem continues to either ping or verify the DNS server at the interval set by the **<dnstime>** parameter. The parameters are: **<rxtime>** Interval (in minutes) at which the modem checks whether data is being received. When this interval is reached, depending on the **<mode>** setting, the modem either sends a DNS query or pings the address specified by the **<PING IP>** parameter. The allowed values are 0 to 240. When set to 0, the Connection Watchdog is disabled. (0 is the default.) **<dnstime>** Interval (in minutes) at which the modem checks for a DNS server or attempts a ping when a new connection is established. The allowed values are 1 to 240. (30 is the default.) On modems with firmware version 2_1_11ap, the allowed values are 0 to 240. On modems with firmware version 2_1_12ap or higher, the allowed values are 1 to 240. (30 is the default.) **dnsport#** DNS port number used by the MP. The allowed values are 1 to 65535. The default is 7367. To avoid selecting a port number that is in use by another component, it is advisable to use the default port number. **dnsname** Website name for DNS to resolve (such as www.sierrawireless.com). (The maximum string length is 128 characters.) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPCWSETUP (continued)	**Set Connection Watchdog (continued)** **AC Reset Flag** Flag that determines whether the radio component is reset when the Connection Watchdog determines that a connection has failed. When set to 0 (the default), the Connection Watchdog terminates invalid connections but does NOT perform a reset. When set to 1, the Connection Watchdog resets the radio component after terminating the connection. *Note: In firmware version 2_1_12ap, the **<AC Reset Flag>** parameter has replaced the **<max number of CW-triggered disconnects>** parameter that was in firmware versions 2_1_11ap. The **<max number of CW-triggered disconnects>** parameter set the modem to reset the radio component after a specified number of consecutive Connection Watchdog-triggered disconnects. (The allowed values were 1 to 65535.)* **<PING IP>** IP address that the modem pings when the **<mode>** parameter is set to ping. The format is X.X.X.X where X is a value between 0 and 255. (The default is 0.0.0.0.) **<mode>** Action that the modem takes when the <rxtime> interval is reached; 0 = DNS query, 1 = ping. As an example, the following AT command would configure the modem to verify a DNS address when a connection is established: at!mpcwsetup=10,30,7367,www.sierrawireless.com,0,0.0.0.0,0 In the above example: • Once a connection is established, the Connection Watchdog goes into “validating mode”, and attempts to validate the DNS server. (<mode> = 0) • DNS validation is performed by looking up the domain name www.sierrawireless.com (<dnsname> = www.sierrawireless.com) • If the DNS lookup fails, the modem remains in “validating mode”, looking up the domain name every 30 seconds (<dnstime> = 30) • If the DNS lookup is successful, the Connection Watchdog goes into “monitoring mode”. The modem checks the Rx byte count every 10 minutes (<rxtime> = 10). If the Rx byte count changes during the 10 minute interval, the connection is deemed to be valid. If the Rx byte count does not change, the modem generates traffic by performing a DNS look-up. If the Rx byte count changes as a result of the DNS look-up, the connection is deemed to be valid. Otherwise the connection is terminated. • The Connection Watchdog does NOT reset the modem after terminating an invalid connection in this example (<AC Reset Flag> = 0). If the <AC Reset Flag> were set to 1, the radio component would be reset after the modem terminated any invalid connection. Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPCWSETUP (continued)	**Set Connection Watchdog (continued)** As another example, the following AT command would configure the modem to ping a specified IP address when a connection is established: at!mpcwsetup=10,30,7367,www.sierrawireless.com,0,100.101.102.103,1 In the above example: • Once a connection is established, the Connection Watchdog goes into "validating mode", and attempts to ping the server. (<mode> = 1) • DNS validation is performed by pinging the address 100.101.102.103 (<PING IP> = 100.101.102.103) • If the ping fails, the modem remains in "validating mode", looking up the domain name every 30 seconds (<dnstime> = 30) • If the ping is successful, the Connection Watchdog goes into "monitoring mode". The modem checks the Rx byte count every 10 minutes (<rxtime> = 10). If the Rx byte count changes during the 10 minute interval, the connection is deemed to be valid. If the Rx byte count does not change, the modem generates traffic by pinging the server. If the Rx byte count changes as a result of the DNS look-up, the connection is deemed to be valid. Otherwise the connection is terminated. • In this example, the Connection Watchdog does NOT reset the modem after terminating an invalid connection (<AC Reset Flag> = 0). If the <AC Reset Flag> were set to 1, the radio component would be reset after the modem terminated any invalid connection.
!MPDIO=<chan>, <value> **!MPDIO? <chan>**	**Set the value at a specified digital IO channel** The MP 555 GPS has four digital input/output channels, allowing digital sensors and gauges to be connected to the modem. All four channels can be used to provide input to the modem. Two of the four can be used alternatively to provide output from the modem. Sensors and gauges must be connected to the appropriate pins of the DB15 I/O connector. (See the *Software Installation, Configuration, and Integration Guide* on the MP 555 GPS installation CD for more information about configuring I/O devices.) The channels correspond to the pins as follows: • **<chan>=1** Digital I/O 1—Pin 3 • **<chan>=2** Digital input 2—Pin 4 • **<chan>=3** Digital I/O 3—Pin 11 • **<chan>=4** Digital input 4—Pin 12 Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPDIO (continued)	**Set the value at a specified digital IO channel (continued)** The initial configuration of the I/O channels must be done using the command **!MPDIOCFG**. Once configured, you can use **!MPDIO** to set the logic level for channels 1 and 3, if configured as outputs. (**!MPDIOCFG** could also be used for this purpose but would require that more parameters be entered.) **!MPDIO?** reports the logic level of all four channels, whether configured as inputs or outputs. The allowed **<value>** settings are **0** (logic level low) and **1** (logic level high).
!MPDIOCFG= <chan>,<type>, "<IO label>", <alarm>, "<logic low label>", "<logic high label>", [<level>] **!MPDIOCFG? <chan>**	**Digital I/O channel configuration** Sets the type (input or output), labels, and alarm trigger, for the specified I/O channel. **Parameter settings** The supported values are: • Channel **<chan>=** 1 Digital I/O 1—Pin 3 (input or output) 2 Digital I/O 2—Pin 4 (input only) 3 Digital I/O 3—Pin 11 (input or output) 4 Digital I/O 4—Pin 12 (input only) • Input/output type **<type>=** 0 Input 1 Output (only valid for channel 1 and 3) • Sensor or gauge description **<IO label>=** 20 character string • Alarm trigger **<alarm>=** 0 No alarm; no logging 1 Alarm triggered (and event logged) when logic level low occurs 2 Alarm triggered (and event logged) when logic level high occurs 3 No alarm; any change in logic level is logged The name and location of the log file is set in Watcher. (See the Watcher online help for details.) • State when logic level is low **<logic low label>=** 20 character string • State when logic level is high **<logic high label>=** 20 character string • Output level **<level>=** This parameter is only valid for channels 1 and 3 and only where <type>=1. 0 Low 1 High **!MPDIOCFG?** returns the configuration values for the specified channel.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPFBKEND= <value> **!MPFBKEND?**	**Set response to CDMA2000 1X re-acquisition** Determines how the modem behaves if CDMA2000 1X service is re-acquired during a Fallback connection (See **!MPFBSETUP**.) The **<value>** setting determines whether the dial-up connection is maintained: • **<value>=0** Disconnect immediately • **<value>=1** Maintain dial-up connection (Default) (Disconnecting may save excess charges for dial-up services.) **!MPFBKEND?** returns the current setting.
!MPFBSETUP= <label>, <username>, <password>, <phone#> **!MPFBSETUP?**	**Configure the Fallback connection** The Fallback feature allows the MP 555 GPS to automatically establish a dial-up (circuit-switched) connection when CDMA2000 1X service is lost during a connection. (Fallback is only useful in areas that have IS95 but not CDMA2000 1X coverage. See the *Software Installation, Configuration, and Integration Guide* on the MP 555 GPS CD for more information about this feature.) **!MPFBSETUP** sets up the dial-up connection invoked by the Fallback feature. These other commands affect the behavior of the feature: • **!MPFBTIME**—determines how long the modem waits between losing CDMA2000 1X service and initiating the Fallback connection. • **!MPFBKEND**—determines how the modem behaves if CDMA2000 1X service is re-acquired during a Fallback connection. • **!MPBARSVC**—enables and disables Fallback and CDMA2000 1X connections (effectively enabling and disabling this feature). Fallback only works where the network supports dial-up connections. **Parameter settings** The supported values are: • Connection description **<label>=** 32 character string • Username **<Username>=** 32 character string • Password **<Password>=** 32 character string • Phone number **<Phone#>=** 32 characters (0-9, #, *) **!MPFBSETUP?** returns the current configuration.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPFBTIME= <value> **!MPFBTIME?**	**Set Fallback timer** Sets the duration that the MP 555 GPS waits between losing CDMA2000 1X service and initiating a Fallback connection. (See **!MPFBSETUP**.) The **<value>** is in seconds (minimum 0, maximum 300). (The default is 60.) **!MPFBTIME?** returns the current timer duration.
!MPGCCLR	**Clear crash dump data** When a crash occurs, data associated with the crash is written to a memory location on the modem. This command deletes the contents of that memory location. (See **!MPGCDUMP**.)
!MPGCDUMP	**Read crash dump data** This command shows the contents of the memory location to which crash dump data is written. (See **!MPGCCLR**.) The memory location is overwritten whenever a crash occurs.
!MPGPSCMD= <"TAIP command">	**Send TAIP command to GPS module** This command requires that the module be configured to use the TAIP protocol. (See **!MPGPSRESET**.) Note that TAIP commands use “>” as the start delimiter and “<“ as the end delimiter. For example, to issue the TAIP command QST (which queries the operational status of the GPS module), you would enter: **AT!MPGPSCMD=">QST<"** For a listing of TAIP commands see the *TAIP Reference* on the Sierra Wireless web site (www.sierrawireless.com) or see the Trimble web site (www.trimble.com). (The GPS module in the modem is the SQ. If no documentation is available for the SQ, see the *SVeeEight Plus GPS System Designer Reference Manual*.)
!MPGPSCOMOUT= <enable>, <save to NV>	**Enable GPS output to the AT command port** This command is only available on modems with firmware version 2.0 or greater. When GPS output to the AT command port is enabled (the **<enable>** parameter is set to 1), the MP 555 GPS sends TAIP or NMEA data to the COM port. This might be used to provide data to a third-party “moving map” application. Setting the **<enable>** parameter to 0 stops the output. (The default is 0.) The **<save to NV>** parameter is used to specify whether the **<enable>** setting is saved to non-volatile memory. If the setting is saved to memory, it persists across power cycles. (The default is 0, where the <enable> setting is NOT saved to memory.) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGPSCOMOUT (continued)	**Enable GPS output to the AT command port (continued)** *Note: When GPS output to the AT command port is enabled, GPS output occurs until the DTR line is deasserted or TIES is issued, depending on the setting made using the command* **!MPGPSESC**. *(See page 44.)* The **<enable>** and **<save to NV>** parameters have this effect: **<enable>=0, <save to NV>=0** GPS data is NOT sent to the COM port. When the modem is reset, GPS data will be sent or not, based on the previously saved <enable> setting. (If no setting has been previously saved, GPS data will NOT be sent to the COM port.) **<enable>=0, <save to NV>=1** GPS data is NOT sent to the COM port. When the modem is reset, GPS data will NOT be sent. **<enable>=1, <save to NV>=0** GPS data is sent to the COM port. When the modem is reset, GPS data will be sent or not, based on the previously saved <enable> setting. (If no setting has been previously saved, GPS data will NOT be sent to the COM port.) **<enable>=1, <save to NV>=1** GPS data is sent to the COM port. When the modem is reset, GPS data will continue to be sent.
!MPGPSDATA?	**Report current GPS data** This returns a parsed string: **Valid Flag** Used internally to verify data. **LED** Status of the GPS LED on the front panel of the modem: 1 Off 2 On flashing 3 On solid **Receiver St1 & Receiver St2** Status Byte 1 and Status Byte 2 As returned by the TAIP command, >QST<. The codes indicate the operational status of the GPS module. (TAIP command documentation is available on the Trimble and Sierra Wireless web sites. See **!MPGPSCMD**.) **Latitude** Latitude in this form:AB.C.D.E: A Direction (N=North, S=South, U=Unknown) B Degree C Minute D Second E Second (decimal place) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGPSDATA? (continued)	**Report current GPS data (continued)** **Longitude** Longitude in this form:AB.C.D.E: A Direction (E=East, W=West, U=Unknown) B Degree C Minute D Second E Second (decimal place) **Altitude** Altitude in meters (+ if above sea level and - if below.) **Horz Sp** Speed in kilometers per hour **Heading** Heading in degrees from True North (0) increasing clockwise **Num SV** Number of satellites fixed. (The modem must have a fix on at least four satellites to report longitude, latitude, heading, altitude, and speed. The maximum number of fixes is eight.) **Data Age** Used internally to determine validity of the data. **UTC Time** Universal Coordinated Time (the time and date in Greenwich, England) in the format: H:M:S:D:MO:Y:OF:FLAG H Hours M Minutes S Seconds D Day MO Month Y Year OF GPS Time Offset (Difference between GPS and UTC time standards) **FLAG GPS Time Offset Flag** (1=valid and 0=invalid)
!MPGPSESC= <escape> **!MPGPSESC?**	**Set method of escaping from GPS output mode to AT command mode** *Note: This command is only available on modems with firmware version 2.0 or greater.* Sets the method of switching from GPS output mode (in which TAIP or NMEA data is sent directly the COM port) to using the COM port to issue AT commands. (See **!MPGPSCOMOUT** on page 42 for an explanation of how to enable the GPS output and how to save that setting to memory.) The **<escape>** parameter is used to set whether GPS output is terminated by deasserting DTR or by issuing TIES: • **<escape>=0** deasserting DTR *(default)* • **<escape>=1** issuing TIES • **<escape>=2** either deasserting DTR or issuing TIES Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGPSESC (continued)	**Set method of escaping from GPS output mode to AT command mode (continued)** TIES (Time Independent Escape Sequence) consists of sending the string "AT+++". (The "AT" must be in upper case). See page 20. The setting made with this command persists across power cycles. **!MPGPSESC?** returns the current setting.
!MPGPSINIT=<init no>, <"TAIP command">	**Set initialization string** Specifies TAIP commands to be executed by the modem on start-up. (This can be used, for example, to set up the automatic reports.) Up to five commands can be configured to execute during initialization. The maximum length of the initialization string is 128 characters. The **<init no>** designates the order in which commands are executed (1=first; 5=last). The command **!MPGPSST?** allows you to query the current initalization strings. (See page 46.)
!MPGPSINTSET=<update interval> **!MPGPSINTSET?**	**Set GPS update interval** Sets the interval at which the GPS module does position and altitude readings. This does not control the frequency at which this data is reported (which is controlled by the **!MPMTCONF** command.) The **<update interval>** is in seconds (minimum 0, maximum 255). The default is 1. **!MPGPSINTSET?** returns the current update interval.
!MPGPSNMEA= [<RMC>],[<GGA>], [<GLL>],[<VTG>], [<GSV>],[<GSA>], [<ZDA>] **!MPGPSNMEA?**	**Set NMEA messages** *Note: This command is only available on modems with firmware version 2.0 or greater.* Sets which NMEA messages are generated by the GPS module when in NMEA mode. (See **!MPGPSRESET**.) The NMEA protocol includes several different message types, of which these are supported: **GGA**—Global positioning system fix data **GLL**—Global position / latitude and longitude **GSA**—GPS DOP (Dilution of Precision) and active satellites **GSV**—Satellites in view **RMC**—Recommended minimum specific GPS/transit data **VTG**—Track made good and ground speed **ZDA**—Time and date Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGPSNMEA (continued)	**Set NMEA messages (continued)** To enable a message, set the parameter to “1”; to disable, set the parameter to “0”. For example: **<GGA>=0** disables the Global positioning system fix data message **<GGA>=1** enables the Global positioning system fix data message Messages are separated by <LF><CR>. By default, the **GGA**, **VTG**, and **ZDA** messages are generated, and these three messages must be enabled in order for Watcher to display GPS information. See the NMEA web site, www.nmea.org to obtain the standards documents that provide the message formats. **!MPGPSNMEA?** returns the setting, showing which messages are currently enabled.
!MPGPSRESET= [<protocol>]	**Reset GPS module** The MP 555 GPS has an embedded Trimble SQ GPS module.The module supports TAIP/TSIP (Trimble ASCII Interface Protocol/Trimble Standard Interface Protocol) and NMEA (National Marine Electronics Association). **!MPGPSRESET** restarts the GPS module setting the protocol. The **<protocol>** value determines the protocol in use following the reset: • **<protocol>=0** TAIP *(default)* • **<protocol>=1** NMEA
!MPGPSST?	**Request GPS status** This returns a parsed string: **State** State of the GPS module: 0 Idle 1 Booting up; sending configuration sequence 2 Active 3 Sent remote command; waiting for acknowledgement 4 Sending command sequence (TAIP command) 5 Waiting for results from query command 6 Resetting; waiting for reset timer to expire **Recv Drop** Number of packets lost because the buffer space was exceeded (0-255) **Recv Len Drop** Number of messages lost because the message length was exceeded (0-255) **Max Rx Buf Used** Maximum number of buffers used (0-255) **Reset Cnt** Number of resets that occurred due to a lack of response from the GPS module (0-255) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGPSST? (continued)	**Request GPS status (continued)** **Protocol** Navigation protocol in use: 0 TAIP 1 NMEA 2 TSIP (for diagnostic use only) **InitBaudRate** Baud rate (4800 or 9600) **localUpdateInt** Local GPS query interval in seconds (0-255) **rmFlag** Bit-mapped storage of the flags set using the >SRM< TAIP command: Bit 0 ID_FLAG: 0=TRUE; 1=FALSE Bit 1 CS_FLAG: 0=TRUE; 1=FALSE Bit 2 EC_FLAG: 0=TRUE; 1=FALSE Bit 3 FR_FLAG: 0=TRUE; 1=FALSE Bit 4 CR_FLAG: 0=TRUE; 1=FALSE **Init Str 1:** First TAIP initialization string executed with the GPS module is powered or reset (Maximum length 128 characters) **Init Str 2:** Second TAIP initialization string executed with the GPS module is powered or reset (Maximum length 128 characters) **Init Str 3** Third TAIP initialization string executed with the GPS module is powered or reset (Maximum length 128 characters) **Init Str 4** Fourth TAIP initialization string executed with the GPS module is powered or reset (Maximum length 128 characters) **Init Str 5** Fifth TAIP initialization string executed with the GPS module is powered or reset (Maximum length 128 characters)
!MPGPSSTOR= <#GPSrecords> **!MPGPSSTOR?**	**Enable / disable storing and forwarding of GPS records** *Note: This command is only available on MP 555 GPS modems with firmware version R2_1_11ap or later.* GPS records (TAIP or NMEA) can be stored on the modem when the modem is out of CDMA coverage and automatically forwarded when CDMA coverage is re-acquired. The parameter **<#GPSrecords>** sets the total number of records the modem accumulates while out of coverage (maximum 1000). When this number is reached, the modem discards the oldest record as each new record is captured so that the stored records are the most recent. The feature is disabled when **<#GPSrecords>** is set to 0. **!MPGPSSTOR?** returns the current setting, showing how many records are being stored.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPGRESET	**Reset the MP and the PC Card module** Generates a hard reset of the modem (the equivalent of powering down then powering up).
!MPGVER?	**Query current firmware revision** Returns a text string identifying the current firmware revision of the PC Card module.
!MPIDTIME= <value> **!MPIDTIME?**	**Sets the inactivity timeout** Sets the interval after which a connection is lost if no data transmission occurs. This applies only if the operating mode is “On demand”. (See **!MPOPMODE**.) This timeout has no effect during PAD sessions. (The PAD has its own inactivity timer. See **!MPPADCONF**.) The **<value>** is in seconds (minimum 1, maximum 3600). The default is 2.
!MPIGNSENSE?	**Report ignition status** The white wire of the power harness is the ignition sense. The modem powers on when this wire is pulled high. (See the *Installation in Vehicles Guide* on the MP 555 GPS CD.) **!MPIGNSENSE?** returns either: • **0** Off—ignition sense is pulled low (less than 2 V) • **1** On—ignition sense is pulled high (5 to 36 V)
!MPMTCONF= <engid>, <ctype>, <destip>, <destport>, <lowtmr>, <fasttmr>, <gpstmr> **!MPMTCONF? <n>**	**Configure MT protocol** A proprietary protocol called “MT” is used to report the GPS and I/O data from the modem. (“MT” is for “Monitoring and Tracking”. The protocol defines the contents and format of the reported data.) The *Software Installation, Configuration, and Integration Guide* on the installation CD provides a description of this protocol. The modem provides four independent reporting engines, allowing the MT data to be simultaneously sent to four different destinations. The **!MPMTCONF** command sets the destination addresses, port numbers, and timers for each of the four engines. Three timers control how frequently MT reports are sent: the low rate timer, the high rate timer, and the GPS timer. Each of these timers can be set to send reports at a different frequency. The high rate timer only becomes active when an alarm condition is triggered by a rise or drop in the level of one of the digital I/O channels. (The **!MPDIOCFG** command controls the alarm triggers on the digital I/O channels.) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPMTCONF (continued) **!MPMTCONF? <n>**	**Configure MT protocol (continued)** When there is no active alarm, the low rate timer and GPS timer determine the frequency of the reports. Where both timers are enabled, the timer with the shortest interval controls the report frequency. The GPS timer (which is in seconds) is generally set to a shorter interval than the low rate timer (which is in minutes). (Having the two timers allows for a system that reports data more frequently in certain conditions. For example, the GPS timer can be disabled when the vehicle is stationary and enabled when the vehicle is moving.) **Parameter settings** The supported values are: • Reporting engine **<engid>=** 0 Engine 0 1 Engine 1 2 Engine 2 3 Engine 3 • Connection type **<ctype>=** 0 Engine is unused 1 MTP embedded in UDP packets 2 Unused 3) Raw GPS data embedded in UDP packets Setting <ctype> to 0 disables the engine. • Destination address **<destip>=** IP address (in the form, nnn.nnn.nnn.nnn) of the destination device. • Destination port number **<destport>=** 1 - 65535 • Low rate timer **<lowtmr>=** 0 Disabled 1-255 Interval between reports in minutes (5 by default.) • Fast rate timer **<fasttmr>=** 0 Disabled 2-30 Interval between reports in seconds (3 by default.) • GPS timer **<gpstmr>=** 0 Disabled 1-255 Interval between reports in seconds (10 by default.) When the GPS timer is disabled, the module continues to send unsolicited reports. **!MPMTCONF?<n>** returns the configuration settings for the engine as specified by <n> (where <n> is 0, 1, 2, or 3)
!MPNVDEF	**Set modem configuration parameters to defaults** Resets parameters stored in non-volative memory to defaults. This includes configuration settings for GPS, I/O, MTP, Fallback, Connection Watchdog, Operating Mode, PAD, and USB.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPOPMODE= <value> !MPOPMODE?	**Select operating mode** The MP 555 GPS has two operating modes: Always On and On Demand. The mode selection determines whether the modem establishes a *modem-to-CDMA* connection in the absence of a *host-to-modem* connection. If there is a *modem-to-CDMA* connection, but no *host-to-modem* connection, the MP 555 GPS can send GPS data and provide notification on the state of any connected sensors or gauges. The *host-to-modem* connection is required if the user wants to web browse or send or receive messages. • **Always On**—the modem establishes a *modem-to-CDMA* connection whenever CDMA2000 1X service is acquired. The connection is only terminated when CDMA2000 1X service is lost or the modem powered down. • **On Demand**—the modem establishes a network connection only when a connect request is made (by an AT command or from an application such as Watcher). That is, the *modem-to-CDMA* connection is established only when the *host-to-modem* connection is requested. When the host disconnects, the *modem-to-CDMA* connection is lost as soon as the inactivity timer expires. (See **!MPIDTIME**.) The **<value>** is either: • **<value>=0** Always On • **<value>=1** On Demand The setting is maintained across power cycles. For more information on the operating modes, see “Host and network connections” on page 16. **!MPOPMODE?** returns the operating mode.
!MPPADCONF= <idle>,<c2c>, <ties>,<fwden>, <fwdchar>, <thre>,<echo>, <edit>,<bs> !MPPADCON?	**PAD configuration** Controls how packets are assembled, how PAD sessions are terminated, and whether echoing and buffer editing are enabled or disabled. *Note: The MP 555 GPS source port number is hard coded and is 7238. This port number should be used as the destination UDP port number by a remote host sending PAD data to the modem.* The PAD assembles and sends a packet to the network when any of the following occur: • The maximum packet length is reached (as defined by the **<thre>** parameter). • The Inter-character timeout expires, (if enabled by the **<c2c>** parameter). • The forwarding character is received, as defined by the **<fwdchar>** parameter, if enabled by the **<fwden>** parameter. Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPPADCONF= (continued) **!MPPADCONF?**	**PAD configuration (continued)** **Parameter settings** The supported values are: • Inactivity timeout **<idle>=** 0 Disabled 1 - 255 Timer duration in minutes The timer counts down from each received data packet. If the timer expires, the PAD session is terminated. • Inter-character timeout **<c2c>=** 0 Disabled 1 - 255 Timer duration in hundreds of milliseconds. Example: If **<c2C>=10**, a packet is sent if no data is received for a period of 1000 milliseconds. • Escape option **<escape>=** When exchanging binary data, it is best to use option 3 or 4 so that TIES (Time Independent Escape Sequence) is disabled. (Otherwise, if the string "AT+++" occurs in the data, it will cause the modem to switch to command mode.) 0 TIES—the modem switches to command mode on receipt of the sequence: "AT+++". 1 TIES and DTR option 1— the modem switches to command mode on receipt of the sequence, "AT+++", or, when the DTR line switches from on to off (maintaining any connected call). 2 TIES and DTR option 2— the modem switches to command mode on receipt of the sequence, "AT+++", or, when the DTR line switches from on to off (terminating any connected call). 3 DTR option 1—the modem switches to command mode only when the DTR line switches from on to off (maintaining any connected call). 4 DTR option 2—the modem switches to command mode only when the DTR line switches from on to off (terminating any connected call). NOTE: When switching to command mode during a PAD session using "AT+++" , the "AT" must be included and must be in upper case. When command mode is invoked in this way, The PAD session remains open. The command "ATO" can then be used to resume the PAD session. The command "ATH" will close the PAD session. • Include/exclude forwarding character **<fwden>=** 0 Disabled 1 On receipt of the primary forwarding character, PAD sends the packet, including the primary forwarding character, and terminates the session. 2 On receipt of the primary forwarding character, PAD forwards the packet, *without* including the primary forwarding character, and terminates the session. • Forwarding character **<fwdchar>=** ASCII code (0-255) for the forwarding character (by default, 13 or <CR>). • Maximum packet length **<thre>=** Length in bytes (minimum 1, maximum 1460). The default is 1460. • Enable/disable echo **<echo>=** 0 Disabled 1 Enabled When enabled, the PAD echoes every character received from the host. If input buffer editing is also enabled, on receipt of the backspace character, the PAD echoes the following:<backspace character><space><backspace character>. (The backspace character is defined using the <bs> parameter.) Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPPADCONF= (continued)	**PAD configuration (continued)** • Input buffer editing **<edit>=** 0 Disabled 1 Enabled When enabled, the PAD removes the last character from the input buffer on receipt of the backspace character. (The backspace character is defined using the <bs> parameter.) • Input buffer backspace character **<bs>=** ASCII code (0-255) for the backspace character (by default, 8, <BS>). **!MPPADCONF?** returns the current PAD configuration.
!MPPADCONN[n]	**Establish PAD connection** Initiates the PAD connection defined by the **!MPPADSETUP** command using the configuration specified by the **!MPPADCONF** command. *Note: The MP 555 GPS source port number is hard coded and is 7238. This port number should be used as the destination UDP port number by a remote host sending PAD data to the modem.* The connection profile used to establish the connection is specified by **n**: • **<n>=1** Profile 1 • **<n>=2** Profile 2 • **<n>=3** Profile 3 Profiles are defined using the **!MPSETUP** command. If **n** is not specified, the default profile is used. The default is defined by the **!MPSETDFLT** command.
!MPPADSETUP=<ctype>, <ipaddr>, <port#>, <autoconn> **!MPPADSETUP?**	**Set up a PAD connection** Creates a UDP or TCP connection with a specified device. This defines the connection established by the **!MPPADCONN** command. *Note: The MP 555 GPS source port number is hard coded and is 7238. This port number should be used as the destination UDP port number by a remote host sending PAD data to the modem.* Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPPADSETUP (continued)	**Set up a PAD connection (continued)** **Parameter settings** The supported values are: • Connection type **<ctype>=** 0 Undefined 1 UDP 2 TCP No data communication is possible when <ctype>=0. • Destination IP address **<IP address>=** IP address (in the form, nnn.nnn.nnn.nnn) of the destination device. • Destination port number **<port#>=** 1 - 65535 • Autoconnection option **<autoconn>=** 0 Disabled *(default)* 1 Enabled When enabled, the modem initiates a connection to the specified destination address and port on power-up. **!MPPADSETUP?** returns the PAD connection setup.
!MPPDDELAY= <value> **!MPPDDELAY? [<querytype>]**	**Set power down timer** Sets the length of a timer that begins counting down when the power is removed or the ignition sense wire is pulled low. (See **!MPIGNSENSE**.) The MP 555 GPS powers down when the timer expires. The **<value>** is in minutes (minimum 0, maximum 240). (The default is 0.) Depending on the **<querytype>**, **!MPPDDELAY?** returns: • **<querytype>=0** Length of the timer *(default)* • **<querytype>=1** Time remaining before expiry
!MPPRIVIP= <IP addr> **!MPPRIVIP?**	**Set the private IP address** The private IP is used for data traffic between the MP and Watcher, to distinguish control and status messages from network traffic. Any valid private IP address can be used. Using a public IP address could cause the application to fail. **!MPPRIVIP** returns the current private IP address. The default is 10.0.0.1

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPSETDFLT= <value>	**Set the default connection profile** The MP 555 GPS allows for three connection profiles. This command sets which is the default: • **<value>=1** Profile 1 is the default • **<value>=2** Profile 2 is the default • **<value>=3** Profile 3 is the default As shipped, the default profile is Profile 1. The default profile is the one used to establish a CDMA2000 1X connection unless the user explicitly selects a different profile.
!MPSETUP= <index>,<label>, <username>, <password>, <dial string>	**Configure a connection profile** The MP 555 GPS allows for up to three connection profiles. See the *Software Installation, Configuration, and Integration Guide* on the MP 555 GPS CD for more detailed information about profiles. (The username, password, and dial string should be obtained from your service provider.) **Parameter settings** The supported values are: • Profile number **<index>=** 1 Profile 1 2 Profile 2 3 Profile 3 • Description of profile **<label>=** 32 character string • Username **<username>=** 32 character string • Password **<password>=** 32 character string • Access Point Name **<dial string>=** 100 character string Unless the user explicitly selects a different profile, the default profile is used to establish CDMA2000 1X connections. (See **!MPSETDFLT** above.)

Table 3-5: ! Prefix commands (cont.)

Command	Description
!MPUSB=<n> **!MPUSB?**	**Enable / disable USB operation** This command is only available on modems with firmware version 2.0 or greater. The MP 555 GPS can be connected to the host PC with either a serial or USB cable. If only a serial cable is in use, this command has no effect. If a USB cable is in use, this command enables and disables USB operation, as specified by **<n>**: • **<n>=1** Enables USB operation (default) • **<n>=0** Disables USB operation If the modem is attached to the host PC by USB cable (or by both a USB and serial cable), USB operation must be disabled to allow for a DUN (Dial-Up Networking) connection using **ATD**. (**ATD** is described on page 69.) The modem must be reset before the command takes effect. (The modem can be reset using the reset button or the **!MPGRESET** command.) **!MPUSB?** returns the current USB state.
!RSSI?	**Received Signal Strength Indication** Reports the current RSSI (P(AGC)+Ec/Io) in dBm using a (N-1)/N IIR filter for smoother display. When no signal is present it reports -137. Reported values can be interpreted as follows: < -90 = very poor -90 to -86 = poor -85 to -81 = fair -80 to -76 = good > -76 = excellent
!SSMS=<p>, <dest>,[cb], "<text>" **!SSMS?**	**Send SMS** Sends an SMS message using these parameters: Parm — Meaning — Range p — priority — 0 = normal; 1 = interactive; 2 = urgent; 3 = emergency (Actual priority transmitted depends on the carrier.) dest — destination # — phone number of destination, maximum of 32 characters; only 0–9, #, and * permitted. cb — callback # (this is optional) — phone number for reply, same 32 character limit text — message body — up to 227 bytes of data (not including the compulsory quote marks. Actual length transmitted depends on the carrier. Continued on next page.

Table 3-5: ! Prefix commands (cont.)

Command	Description
!SSMS (continued)	**Send SMS (continued)** The text is enclosed in quotations. The quote character cannot appear in the body text. Body text over the carrier defined limit will be truncated and sent anyway. 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
!STATUS	**Status of the modem** Reports the modem's status as follows: Current band: <band> Current channel: <chan> SID: <sid> NID: <nid> Roaming: <n> Temp: <temp> Pilot [NOT] acquired Modem has [NOT] registered <band> is either PCS or CDMA <n> for the roaming indicator is 0=home, 1=roaming <temp> is the radio temperature in degrees C. NOT appears in cases where the pilot has not been found or the modem has not registered. The MP 555 GPS does *not* report the SID/NID/Roaming line nor the Temp: line. See also **+CSS** (Serving System).

$ Prefix

Table 3-6: $ Prefix command

Command	Description
$QCVAD=<n>** **$QCVAD?	**Answer Data Call** Sets or reads the mode for answering data calls with **A** (Answer) or autoanswer via **S0=1**. Value Setting **0** Off (answer as voice) (Default) (not supported) 1 Fax for next call, then revert to Off (voice)* (not supported) 2 Fax for all calls (not supported) 3 Async data for next call, then revert to Off (voice)* (not supported) 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 3-7: & Prefix commands

Command	Description
&C[n]	**Data Carrier Detect Control** 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)
&D[n]	**Data Terminal Ready Options** Determines what actions are taken by the modem in response to the Data Terminal Ready (DTR) signal from the host (DTE). DTR must be off for a period of 2–10 milliseconds in order for action to be taken. 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. **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. See Table 3-18 on page 76 on page 76 for information on factory settings. 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.

+A Prefix

Table 3-8: +A Prefix command

Command	Description
+ATINIT=<cmd> [,C|T[,s[,c]]] **+ATINIT?**	**AT Initialization** Stores an AT command string into the modem or queries the modem for the current initialization string. If the initialisation 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 will be executed upon modem power-up or reset. This parameter has a maximum length of 40 characters. To avoid parsing errors, commas and semi-colons in the initialization string must be replaced as noted by the **s** and **p** 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. Samples: **AT+ATINIT=+GMR,c** Stores the single command "**+GMR**" to report the revision of the firmware. **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**

Table 3-8: +A Prefix command (cont.)

Command	Description
+ATINITSTATE=<n> **+ATINITSTATE?**	**AT Initialization State** Enables or disables 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 3-9: +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
+CBC?	**Battery Charge (Read-only) (local only)** Reports the power source and battery level in the form +CBC: status,level. The Sierra Wireless products do not have internal batteries so always return a value of +CBC: 1,100 meaning they are 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 OK result code is returned without a response. See also **+CMIP** (Mobile IP Address)

Table 3-9: +C Prefix commands (cont.)

Command	Description
+CFG="<str>" **+CFG?**	**Configuration String** 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.
+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)
+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)
+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)
+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)
+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).

Table 3-9: +C Prefix commands (cont.)

Command	Description
+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. 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.
+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)
+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 3-16 on page 75. Extended cellular call progress codes are in Table 3-17 on page 76.
+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 (Default) 1 Packet data service, Relay Layer interface

Table 3-9: +C Prefix commands (cont.)

Command	Description
+CSQ?	**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. SQM Meaning 0-31 00 is lowest quality signal, 31 is the highest. This is based on received signal strength. 99 Value not known or is not detectable. FER Meaning 0 <0.01% 1 0.01% >= FER < 0.1% 2 0.1% >= FER < 0.5% 3 0.5% >= FER < 1.0% 4 1.0% >= FER < 2.0% 5 2.0% >= FER < 4.0% 6 4.0% >= FER < 8.0% 7 FER >= 8.0% 99 Value is not known or is not detectable. See also **!RSSI** for received signal strength in dBm.
+CSS?	**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 the modem is currently registered with. 99999 Modem is not registered. See also **!STATUS** (Status)

Table 3-9: +C Prefix commands (cont.)

Command	Description
+CTA=<n> **+CTA?**	**Packet Data Inactivity 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: Leave this set to 0. The network will govern dormant mode timing.* See also **+CQD** (Command State Inactivity Timer)
+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) to close the airlink. Value Meaning **0** Do not pass unrecognized commands. (Default) 1 Open a transport layer connection and pass the unrecognized command to the IWF.

+G Prefix

Table 3-10: +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) +MS — Modulation control (+MS, +MR) +MV18S — V.18 modulation control (+MV18S, +MV18R) +ES — Error control (+ES, +EB, +ER, +EFCS, +ETBM) +DS — Data compression (+DS, +DR)
+GMI	**Get Manufacturer** Reports the modem's manufacturer. See also **+CGMI** (Get IWF Manufacturer)
+GMM	**Get Model Number** Reports the modem model. See also **+CGMM** (Get IWF Model)
+GMR	**Get Revision** Reports the modem firmware version: revision level and date, followed by the version for the Preferred Roaming List (PRL) in use. It also reports the hardware revision. See also **+CGMR** (Get IWF Revision)
+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)

+I Prefix

Table 3-11: +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. 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)
+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).
+IPR=<n> **+IPR?**	**Fixed Port (R_m) Rate** Sets or queries a fixed local data rate for the local connection (between modem and computer): • **<n>=[bits per second]** sets the data rate. Permitted values are **300, 1200, 2400, 9600, 19200, 28800, 38400, 57600, 115200** (the default), and **230400**. • **<n>=0** instructs the modem to use the host's data rate automatically (autobauding). With this setting, the modem adjusts to the host data rate only once on start-up. The modem does not adjust to changes in the host data rate between start-ups. *Note: Watcher can only communicate with the modem when the data rate is at 115200 kbps. If you intend to run Watcher, using autobaud or any setting other than 115200, is NOT recommended.* *Note: When using autobauding, issuing a "ping"* **AT<CR>** *command (with no other characters) should yield an* OK *response. If not, send another* **AT<CR>** *to permit the modem to adapt to the host data rate.* **+IPR?** returns the current setting.

+M Prefix

Table 3-12: +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. The default setting is null. See IS-131 for details on parameters and use.
+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. Consult the IS-131 specification for details on the intermediate result codes possible. Use **+GCAP** (Get Capabilities) to query the IWF for confirmation that the command is supported. 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. Use **+GCAP** (Get Capabilities) to query the IWF for confirmation that the command is supported. The +MS result must be in that response. The default setting is null. See IS-131 for details on parameters and use.
+MV18R=<n> **+MV18R?**	**V.18 Reporting** Enables or disables the extended result codes for +MV18R: from the IWF to the modem. Use **+GCAP** (Get Capabilities) to query the IWF for confirmation that the command is supported. The +MV18S result must be in that response. Value Meaning **0** Disables reporting of V.18 result codes. (Default) 1 Enables reporting. Continued on next page.

Table 3-12: +M Prefix Commands (cont.)

Command	Description
+MV18R (continued)	**V.18 Reporting (continued)** 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
+MV18S=[m], [ans],[fb] **+MV18S?**	**V.18 Selection** Controls the manner and operation of the V.18 capabilities in the IWF (if present in the IWF). Use **+GCAP** (Get Capabilities) to query the IWF for confirmation that the command is supported. The +MV18S result must be in that response. Parm Value Meaning m **0** Disable V.18 operation (Default) 1 V.18 operation, auto detect mode 2 V.18, connect in 5-bit (Baudot) mode 3 V.18, connect in DTMF mode 4 V.18, connect in EDT mode 5 V.18, connect in V.21 mode 6 V.18, connect in V.23 mode 7 V.18, connect in Bell 103-type modean s **0** Disable V.18 answer operation (Default) 1 No default specified (auto-detect) 2 V.18 operation, connect in 5-bit (Baudot) mode 3 V.18, connect in DTMF mode 4 V.18, connect in EDT mode fb **0** Disable fallback (Default) 1 Enable fallback to re-acquisition after 2 seconds of no transmission. The default setting is **+MV18S=0,0,0** meaning V.18 operation is disabled.

No Prefix

Table 3-13: Alphabetic AT commands

Command	Description
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.
D [options]	**Dial** Initiates a data call. 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 calls are possible based on the option(s) entered. **Packet Data calls** Traditional CDMA data call dialling uses the parameter "**#777**". This triggers the modem to try a connection using the detected service type: 1xRTT or QNC (IS-95). It is possible that 1xRTT 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 1xRTT call on some networks as well. In these situations the call is likely to fail. You should force the modem to attempt one service type or the other by using dedicated dial strings dictated by the carrier. Typically (but not in all cases) the strings are: **#762** "QNC" – Connect to QNC using IS-95 service **#19788** "1XRTT" – Connect PPP using 1xRTT service Your connection software must manage use of the correct password for the type of service used. **Async (CSC) Data** TThe modem does not actually dial the number in the string. For an IS-95 call, the dial string is passed to the IWF where a modem there issues the dial over the PSTN. Prior to passing the dial command, the modem sends the IWF modem the string defined in **+CFG** (Configuration String) to configure the IWF modem for the call. For dialling an async data 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. Continued on next page.

Table 3-13: Alphabetic AT commands (cont.)

Command	Description
D [options] (continued)	The options listed below are commonly supported but specific IWF modem capabilities govern the list of supported parameters. Opt. 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. 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 3-15, “Result codes,” on page 74.
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 (see page 24 for details). Value Setting 0 Disable echo **1** Enable echo (Default)
H[0]	**Hook Control** Go ON-Hook to disconnect a data call. 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.
L[n]	**Loudness - Speaker Volume** This command is provided for compatibility reasons; no action is taken by the modem. Parameters are ignored.

Table 3-13: Alphabetic AT commands (cont.)

Command	Description
M[n]	**Mute - Speaker Control** This command is provided for compatibility reasons; no action is taken by the modem. Parameters are ignored.
O	**On-line (Remote)** 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; no action is taken by the modem.
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).
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). Zeros are assumed where parameter values are omitted. Var. Range n Valid S-register number (See Table 3-14 on page 73 on page 73 for values). 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) outside of permitted range.

Table 3-13: Alphabetic AT commands (cont.)

Command	Description
T	**Tone - Set DTMF Dialing** This command is provided for compatibility reasons; no action is taken by the modem.
V[n]	**Verbose - Result Code Form** Specifies whether the modem displays the result codes in numeric format or as words (verbose). See Table 3-15 on page 74 for a numerical list of the result codes. Note that numeric codes are returned as ASCII character numerals. This command also affects framing of responses (see page 24 for details). 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 is issued. **Dial tone detection** When disabled, the modem waits for the period set in register **S6** (Wait for Blind Dial) and blind dials. When enabled, the modem allows five seconds to receive at least 1 second of dial tone. If none is detected then the result code is NO DIAL TONE. **Busy signal detection** When disabled, the modem waits for the period set in register **S7** (Wait for Carrier). If no connection is made then the result code is NO CARRIER. When enabled, the modem can return the result code BUSY if detected. Values enable (✓) or disable (✗) tone detection and result codes as indicated in the chart below: Value 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. See Table 3-18 on page 76 for information on factory settings.

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 3-14: 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
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 dialling. 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	050	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

Table 3-14: S registers (cont.)

Reg.	Description	Range	Default	Units
9	Carrier Detect Response Time (Remote) This 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) This 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 dialling. This register is *not* used by the **~DTMFB** command. See **~TONDUR** (Tone Duration).	50–255	095	0.001 s

Result codes

Basic result codes

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

Table 3-15: 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.

Table 3-15: Result codes

Code	Verbose	Meaning
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 3-16: Extended cellular result codes

Code	Verbose	Meaning
11	RING ASYNC	Indicates an incoming CSC 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.
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 3-17: 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 (not supported), or STU-III (not supported).

* 11–13 in Table 3-16 on page 75

Stored profile settings

The Sierra Wireless CDMA2000 1X modems do not support a user-defined profile. Both **Z** (Reset) or **&F** (Factory Settings Restore) restore these settings.

Table 3-18: Profile settings

Command	Description	Factory
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)

Table 3-18: Profile settings (cont.)

Command	Description	Factory
V	Verbose - Result Code Form	1 (Words)
X	Result Code Select/Call Progress Control	4 (all codes)
&C	Data Carrier Detect Control	2 (UNIX wink)
&D	Data Terminal Ready Options	2 (Hang up)
+CFG	Configuration String	(null)
+CMUX	Multiplex Option	C (Forward link) 2 (Reverse link)
+CQD	Command State Inactivity Timer	10 (50 seconds)
+CRC	Cellular Result Codes	0 (disabled)
+CRM	Local (R_m) Interface Protocol	0 (async data)
+CXT	Cellular Extension	0 (do not pass)
+ICF	Character Framing	3, 3 (ignored)
+ILRR	Local Rate Reporting	0 (off)
+IPR	Fixed Port (R_m) Rate	115200 (ignored)
+MA	Modulation Automode	(null)
+MR	Modulation Reporting	0
+MS	Modulation Selection	(null)
+MV18R	V.18 Reporting	0 (disabled)
+MV18S	V.18 Selection	0, 0, 0
+FCLASS	Modem Operating State	0 Data (async)
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)	050 (50 seconds)
S8	Comma Pause Time (Remote)	002 (2 seconds)
S9	Carrier Detect Response Time (Remote)	006 (0.6 seconds)

Table 3-18: Profile settings (cont.)

Command	Description	Factory
S10	Lost Carrier Hang-up Delay (Remote)	014 (1.4 seconds)
S11	DTMF Dialing Speed (Remote)	095 (0.095 s)

Appendix A: Working With the IWF

- Introduction
- Local and remote
- Airlink control
- Defaults and configuration

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 the 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

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 will return an ERROR result when the airlink to the IWF is active, but will 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 will be 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**), the local modem will open the airlink and pass the command to the IWF, then relay the response to the local host; otherwise the local modem returns ERROR for unrecognized commands. These commands work on the transport layer in the airlink between the two modems. A command such as **+CGCAP** is in this class.

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

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

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 will cause 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 will give 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.

In cases where the modem can find a channel but is not permitted to register, attempts to establish the airlink will result in the NO CARRIER result.

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.*

Initializing the airlink

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

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

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.

See “Command handling” on page 21. for further details on how the command line is processed.

Closing the airlink

The airlink is closed whenever a call terminates through:

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

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

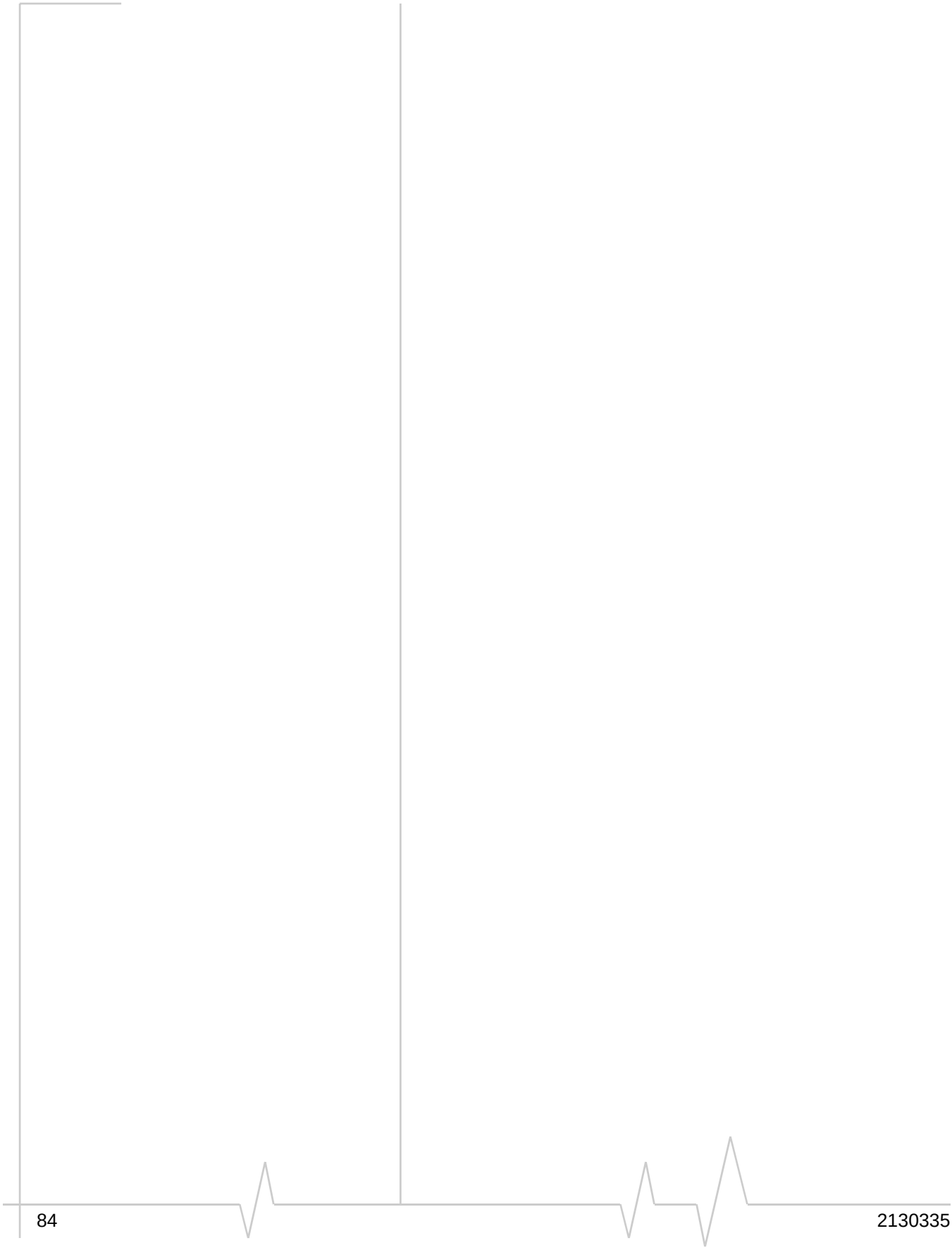
When the airlink is closed, the local modem reports to the host (DTE) with the NO CARRIER result code.

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.



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