CDMA 1xEV-D0

AT Commands
Reference Guide

MultiTech® ●
Systems

CDMA 1xEV-D0 AT Commands Reference Guide for the following products:
  SocketModem® (MTSMC-EV-2)

PN S000482A, Version A

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Chapter 1 – Introduction

Document Structure

Following this introduction is a section on basic elements important to understanding and communicating with the modem. This includes discussions of the QNC (Quick Net Connect) call setup process and interaction with the CDMA Interworking Function (IWF), as well as notes on the connection between the host (DTE) and the Wireless modem (DCE).

The document then presents the commands, registers, result codes, and defaults provided in the command state of the modem.

Commands are often termed AT commands since this character sequence (originated by Hayes™) is used to prefix each specific command.

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

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

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

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

Result codes, both numeric and verbose, are provided in a separate table.

Extended Cellular Result Codes are also listed separately.

Conventions

The following format conventions are used in this reference.

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

Numeric values are decimal unless prefixed as noted below.

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

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

Command and register syntax is noted using an alternate font: !DSMS=<i>[,m].

The "AT" characters are not shown, but must be included before all commands except as noted in the reference tables.

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

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

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

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

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

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

<div align="center">CONNECT 14400</div>

Modem Basics

CDMA Basics

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

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

Traditional Wire Line

Before looking at the call setup process in CDMA, let's take a moment to review the traditional wire line 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 wire line connection.

CDMA IS-95B

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

<div align="center">**CDMA IS-95B Call Connection Block Diagram**</div>
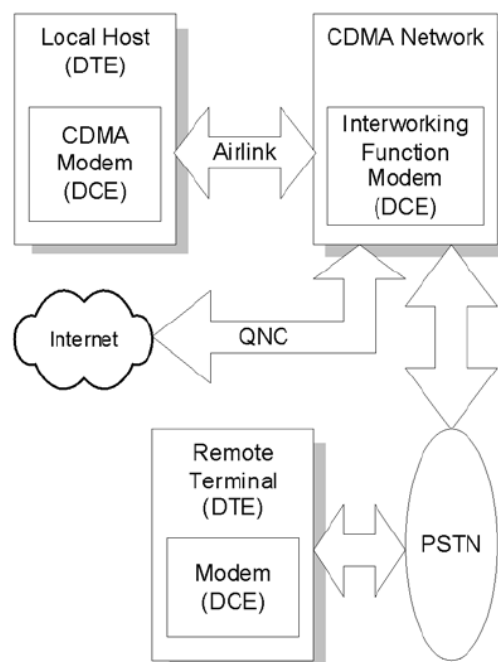
When using IS 95, there is special handling of AT commands. For a detailed explanation, consult Appendix A

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

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

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

CDMA 1X

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

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

CDMA 1xEV-DO

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

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

Voice Service

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

Host Connection Basics

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

Modes, States, and Conditions

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

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

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

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

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

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

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

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

Modes

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

Data (CSC, QNC, or Packet)

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

Voice

The product is being used for voice communication. In addition to the basic modes (data and voice), there are states and conditions to consider.

States

The modem's state, in conjunction with its condition, governs how the modem handles traffic to and from the host (DTE), and to and from a remote modem. Data mode can support up to three states: Command, Pass through, and Data.

Command

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

Passthrough

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

Data

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

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

Conditions

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

Online

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

Offline

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

While in offline condition the modem can only be:
- In command state (without an airlink), or
- In pass through 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 pass through state (IS-95B), which exchanges commands and replies between the host (DTE) and the IWF modem (DCE). The data is not sent all the way through the active connection to the remote terminal. The remote connection is still active (carrier is maintained) but data is not forwarded to the remote end.

State Transitions

On power up the modem is in command state.

Command to Data State

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

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

Data to Command State

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

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

SLIP mode transitions:

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

PPP mode transitions:

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

Modem Buffers

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

Command Buffer

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

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

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

Data Buffers

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

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

Speed Buffering

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

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

Command Handling

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

Commands may be entered in upper or lower case.

Concatenation

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

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

Parameters

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

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

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

Registers

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

Some registers store the setting of commands. Changing the register is equivalent to changing the command setting. See the Table of S-Registers for the standard default values.

See the Table of Stored Profile Settings for the factory defaults.

Responses and Result Codes

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

Possible Result Codes

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

See the Table of Result Codes, giving both the numeric and verbose results.

Human vs. Machine Interface

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

As shipped the modem is configured with these settings:

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

With Echo on (E1 - the default), data received from the local host while in command state is echoed back to the host. This can present problems to machine control, which is not interested in an echo of its own commands to the modem. In some configurations the echo should be turned off (E0).

The configuration for most machine-controlled hosts is more likely to be set to Echo Off, and Verbose Off or possibly Quiet On.

Framing

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

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

Framing Characters

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

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

Response Framing

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

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

The setting of Quiet (Q) has no impact on responses.

Result Code Framing

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

A leading <CR><LF> is inserted ahead of the result code if Verbose (V) is on (=1), otherwise there are no leading characters prior to the ASCII numeral result.

The result code is always followed by a <CR>. There is a trailing <LF> only if Verbose is on. Samples:

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

V=0 0<CR>

Chapter 2 – Overview of Commands

Introduction

The modem supports commands for:

- IS 95B data service
- 1X packet service
- SMS
- GPS

AT Commands Summary by Function

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 Action Commands

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

Basic Modem Configuration Commands

Command	Description
&C	Data Carrier Detect Control
&D	Data Terminal Ready Options
+ATINIT	AT Initialization
+ATINITSTATE	AT Initialization State
+CFG	Configuration String
+CMUX	Multiplex Option
+CQD	Command State Inactivity Timer
+CRC	Cellular Result Codes
+CRM	Local (Rm) Interface Protocol
+CTA	Packet Data Inactivity Timer
+CXT	Cellular Extension
+FCLASS	Modem Operating State

Command	Description
+ICF	Character Framing
+ILRR	Local Rate Reporting
+IPR	Fixed Port (Rm) Rate
+MA	Modulation Auto mode
+MR	Modulation Reporting
+MS	Modulation Selection
+MV18R	V.18 Reporting
+MV18S	V.18 Selection
+WWKUP	Wake-up Events Mask
E	Echo (Command State)
L	Loudness (Speaker Volume)
M	Mute (Speaker Control)
P	Pulse Dialing
Q	Quiet – Result Code Display Option
S	S-Register Read and Write
T	Tone Dialing
V	Verbose – Result Code Form
X	Result Code/Call Progress Control
-HDSET	Headset Detection Option
-TONDUR	Tone Duration

Advanced Modem Configuration Commands

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

Account Activation Commands

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

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

Device and Service Interrogation Commands

Command	Description
I	Product identification information
!ECIO	Ec/Io
!GMODE	Mode of the modem
!MDMVER	Version of the modem firmware
!PREV	Protocol Revision
!PRLVER	PRL version
!RSSI	Received Signal Strength Indication
!STATUS	Modem status report
!SYSTIME	CDMA time
+CAD?	Analog or Digital Service (Read-only) (local only)
+CBC?	Battery Charge (Read-only) (local only)
+CBIP?	Base Station IP Address (Read-only)
+CGCAP	Get IWF Capabilities
+CGMI	Get IWF Manufacturer
+CGMM	Get IWF Model
+CGMR	Get IWF Revision
+CGOI	Get IWF ISO ID
+CGSN	Get IWF ESN
+CMIP	Mobile Station IP Address (Read-only)
+CSQ	Signal Quality (Read-only)
+CSS?	Serving System (Read-only)
+GCAP	Get Capabilities
+GMI	Get Manufacturer
+GMM	Get Model Number
+GMR	Get Revision
+GOI	Get ISO ID
+GSN	Get ESN
+WGETWK	Request Wake-up Reason
S81	S-Register Read

SMS Messages Commands

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

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

Chapter 3 – ! Prefix Commands

Result codes are not shown in the following commands unless special conditions apply. Generally, the result code OK is returned when the command has been executed. ERROR may be returned if parameters are out of range and is returned if the command is not recognized or is not permitted in the current state or condition of the modem. A full list of result codes (verbose and numeric) is provided in the Result Code Table later in this manual.

!APPSUBTYPES   Negotiated Subtypes

Syntax: AT!APPSUBTYPES

Description: Application subtypes negotiated for the four streams.

Example: AT!APPSUBTYPES
Stream0: Default Signaling Application
Stream1: Default Packet Application for SN
Stream2: Default Packet Application for AN
Stream3: Default Test Application
OK

!CNTSMS   Count SMS

Syntax: AT!CNTSMS

Description: Reports the number of messages stored in the modem as follows:

New Urgent Msg	{Index = 1}:	<n>
New Regular Msg	{Index = 2}:	<r>
Old Messages	{Index = 3}:	<o>
Voice Messages	{Index = 4}:	<v>

The Index number corresponds to the SMS list index used to retrieve and delete messages. The counters n, r, o, and v indicate the number of messages in each list.

When retrieving (!GSMS) or deleting (!DSMS), the message number is base 1, so the highest message number in any list is the same as the reported count.

!DASMS   Delete All SMS

Syntax: AT!DASMS

Description: Deletes all SMS messages from all four SMS lists. Use this command with care, as confirmation is not required.

!DSMS=   Delete SMS (Selective)

Syntax: !DSMS=<i>[,m]

Description: Deletes one or all messages from one of the index lists (for the definitions of the SMS index lists, see !CNTSMS).

Parm	Meaning
i	Message list (index 1, 2, 3, or 4)
m	Message number

Message number 1 is the oldest message, and the number reported by !CNTSMS, is the most recent message.

If the message number parameter is omitted, then all messages in the specified index list are deleted.

Normally messages are only deleted from list 3 (old).

!ECIO?   Ec/Io

Syntax: AT!ECIO?

Description: If there is an active pilot, returns the current Ec/Io in units of 1dB. See also !RSSI.

!GMODE   Mode of the Modem

Syntax: AT!GMODE

Description: Asks for the mode of the modem. Returns either "ONLINE" or "OFFLINE"

!GPSDLOAD=   Download of Ephemeris and Almanac Data

Syntax: AT!GPSDLOAD=<freq>,<duration>

Description: Initiate a download of ephemeris and almanac data.

If the application requesting this data will be requiring the use of the data over a period of time, the application should indicate that the download should be periodic.

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

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

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

Example 1:   AT!GPSDLOAD=2,1
              OK

Example 2:   AT!GPSDLOAD=1,60
              ERRCODE = 17

!GPSEND= End Specified Session

Syntax: AT!GPSEND=<sesstype>

Description: End an active position location session.

Either the current position fix session or the current download data session may be aborted. (There may be one of each type of session open simultaneously.)

Parm	Value	Meaning
sesstype		Type of session to abort:
	0	Position Fix
	1	Data Download

If the modem is unable to abort the specified session, or the session is not active, an error code is returned. For a list of supported error codes, see !GPSDLOAD

Example: AT!GPSEND=0
OK

!GPSFIX= Initiate a Location Fix

Syntax: AT!GPSFIX=<fixtype>,<maxtime>,<maxdist>

Description: End an active position location session.

While the fix is in progress, the application may query the status of the session (!GPSSTATUS).

Once the status shows that the fix is complete, the application should use !GPSLOC to obtain the result.

If the modem is unable to initiate the location fix, an error code is returned. For a list of supported error codes, see !GPSDLOAD.

Parm	Value	Meaning
fixtype		Type of fix to perform
	1	Standalone
	2	MS-Based Only
	3	MS-Assisted Only
	4	Optimized for speed
	5	Optimized for accuracy
	6	Optimized for data
maxtime		
	0 - 255	Number of seconds allowed to capture satellite information
maxdist	0 – 4294967280	Accuracy (in meters) the application prefers

Example 1: AT!GPSFIX=2,30,200
OK

Example 2: AT!GPSFIX=3,60,100
ERRCODE = 18

!GPSLOC   Get Last Known Location of the Modem

Syntax: AT!GPSLOC

Description: This command does not initiate a position location session; rather, it attempts to access the information from the most recent position location session. If the data is not available, the response indicates that the location is unknown (see Example 1).

> **Note:**   The Altitude and/or Heading information are included only if this data was collected as part of the most recent location fix.

For a 2D fix, VelVert is set to 0.

Example 1:

```
AT!GPSLOC
Unknown
OK
```

Example 2:

```
AT!GPSLOC
Lat: 33 Deg 7 Min 21.00 Sec N (0x005E3712)
Lon: 117 Deg 16 Min 10.31 Sec W (0xFEB26EEF)
Time: 200603174135634
LocUncAngle: 0     LocUncA: 8     LocUncP: 9
3D Fix
Altitude: 43           LocUncVe: 11
Heading: 0             VelHoriz: 515        VelVert: 0
OK
```

Example 3 ("Altitude" not included):

```
AT!GPSLOC
Lat: 33 Deg 7 Min 21.00 Sec N (0x005E3712)
Lon: 117 Deg 16 Min 10.31 Sec W (0xFEB26EEF)
Time: 200603174135634
LocUncAngle: 0     LocUncA: 8     LocUncP: 9
2D Fix
Heading: 0             VelHoriz: 515        VelVert: 0
OK
```

!GPSLOCK=   Queries or Sets the GPS Lock

Syntax: AT!GPSLOCK=<lock>   (Set Command)
                 AT!GPSLOCK?   (Query Command)

Description: Queries or sets the GPS lock for location processing

Value	Meaning
0	No GPS lock active
1	Mobile initiated sessions locked
2	Mobile terminated sessions locked
3	All GPS sessions locked (except 911)

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

Example:

```
AT!GPSLOCK=2
OK
```

!GPSSATINFO   Query the Modem for Information for All Satellites

Syntax: AT!GPSSATINFO

Description: Query the modem for information for all satellites in view and those used in the last known, successful location fix.

The information is valid regardless of fix mode or whether the PDE or the modem performs the fix calculations. Information is displayed for up to 12 satellites.

Meanings of Abbreviations:

- SV: Satellite vehicle number (1-32)
- ELEV: Satellite elevation (0-90°)
- AZI: Satellite azimuth (0-360°)
- SNR: Signal to Noise Ratio, in dB (0-99)
- "*" indicates that this satellite was used in the fix calculation.

Example:

```
AT!GPSSATINFO?
Satellites in view: 5
* SV:21 ELEV:56 AZI:323 SNR:40
* SV:24 ELEV:52 AZI: 43 SNR:37
* SV:18 ELEV:51 AZI:226 SNR:42
* SV:26 ELEV:35 AZI: 85 SNR:22
* SV:16 ELEV:23 AZI:298 SNR:32
OK
```

!GPSSTATUS   Get the Status of Position Location Sessions

Syntax: AT!GPSSTATUS

Description: Get the status of position location sessions (Fixed and Download)

Status	Meaning
NONE	No session of this type has occurred since power up
ACTIVE	A session of this type is currently active
SUCCESS	The most recent session of this type had succeeded
FAIL	The most recent session of this type had failed

The session status includes a timestamp of when the last session's status was determined. (If a session is active, the system time of when the session entered the ACTIVE state is displayed.) If a session has a FAIL status, an error code ("FAILCODE") is also displayed.

Example 1:

```
AT!GPSSTATUS
200505166000104 Last Fix Status = SUCCESS
200505166000215 Last DLoad Status = SUCCESS
200505166000104 Fix Session Status = ACTIVE
200505166000215 DLoad Session Status =
SUCCESS
OK
```

Example 2:

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

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

!GPSTRACK= Initiate a Location Tracking Session

Syntax: AT!GPSTRACK=<fixtype>,<maxtime>,<maxdist>,<fixcount>,<fixrate>

Description: Initiate a location tracking session. This command should be used when an application requires multiple location fixes over a small period of time (for example, a fix between every 1 to 240 seconds).

Using the <fixcount> and <fixrate> parameters, the application can specify how many fixes should be done, and at what rate they should occur. (<fixrate> is measured as the number of seconds from the start of one fix to the time that the subsequent fix is triggered.)

Due to the potential need for first updating the ephemeris, almanac and/or location data, the "time to first fix" may require more time than the subsequent fixes.

Tracking applications need to consider this possible initial delay and may want to behave proactively by initiating, as part of their startup sequence, a Data Download session and/or a single location fix. As a guideline: almanac data is valid for 3 to 4 days, ephemeris data is valid for 30 to 120 minutes, coarse location data is valid for 4 minutes.

While the session is in progress, the application may query the status of the session (!GPSSTATUS). Once the status shows that the session is complete, the application should use !GPSLOC to obtain the result.

If the modem is unable to initiate the tracking session, an error code is returned.

Parm	Value	Meaning
fixtype		Type of fix to perform
	1	Standalone 2 MS-Based Only
	3	MS-Assisted Only
	4	Optimized for speed
	5	Optimized for accuracy
	6	Optimized for data
maxtime	0 - 255	Number of seconds allowed to capture satellite information
maxdist	0 – 4294967280	
		Accuracy (in meters) the application prefers
fixcount	1 - 999, or 1000 = continuous	
		Number of fixes to perform
fixrate	0 – 1800	Number of seconds between each fix

!GSMS?   Get SMS

Syntax: AT!GSMS?<i,m>

Description: Read an SMS message from the modem. The message read is determined by the parameters:

Parm	Meaning
i	message list (index 1, 2, or 3)
m	message number

Message number 1 is the oldest message, and the number reported by !CNTSMS, is the most recent message.

After a new message is read, it is placed in message list index 3 (old messages).

The following information may be displayed:

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

!MDMVER?   Version of the Modem Firmware

Syntax: AT!MDMVER?

Description: Returns the firmware version being run on the modem.
See also +GMR (Get Revision).

!MUFWDRESET   Reset Data in !MUFWDSTATS

Syntax: AT!MUFWDRESET

Description: Resets all the data reported by !MUFWDSTATS.

!MUFWDSTATS   Current Traffic Channel Statistics

Syntax: AT!MUFWDSTATS

Description: Current Multi-User Forward Traffic Channel Statistics.
!MUFWDRESET resets the data reported by this command.

Example:

```
at!mufwdstats
FORWARD TRAFFIC CHANNEL
          CRC Count                          Termination Slot Count
          --------Good CRCs----Bad CRCs   1   2   3   4
          DRC3_128    0          -        0   0   0   0
          DRC3_256    0          -        0   0   0   0
          DRC3_512    0          -        0   0   0   0
          DRC3_1024   0          0        0   0   0   0
          DRC5_2048   0          0        0   0   0   0
          DRC8_3072   0          0        0   0
          DRC10_4096  0          0        0   0
          DRC13_5120  0          0        0   0
          Packet Error Rate (%): 0.000
          OK
```

!PERSONALITY?   Displays Current Personality

Syntax: AT!PERSONALITY?

Description: Displays the Current Personality and its negotiated protocol subtypes.

Example:

```
at!personality?
Current Personality: 0
Physical Layer Protocol Subtype: 0
Control Channel MAC Protocol Subtype: 0
Access Channel MAC Protocol Subtype: 0
Fwd Traffic Channel MAC Protocol Subtype: 0
Rev Traffic Channel MAC Protocol Subtype: 0
Key Exchange Protocol Subtype: 0
Authentication Protocol Subtype: 0
Encryption Protocol Subtype: 0
Security Protocol Subtype: 0
Idle State Protocol Subtype: 0
Generic MM Cap Disc Protocol Subtype: 0
Generic Virtual Stream Protocol Subtype: 0
OK
```

!PREV?   Protocol Revision

Syntax: AT!PREV?

Description: Queries the modem for the current protocol revision reported by the current base station the modem is communicating with. The response is a decimal digit as noted below.

Value	Meaning
1	JSTD-008 (PCS)
2	IS-95
3	IS-95A (cellular)
4	Minimum requirements for IS-95B
5	Full requirements for IS-95B
6	CDMA 1X Rev. 0
7	CDMA 1X Rev. 1

!PRLVER?   PRL Version

Syntax: AT!PRLVER?

Description: Returns the version of the PRL stored in the modem.

!PROTSUBTYPES?   Negotiated Subtypes

Syntax: AT!PROTSUBTYPES?

Description: Displays Negotiated Subtypes for all protocols in all stored personalities.

Example:
at!protsubtypes
Number of Stored Personalities: 1
Current Personality: 0
Personality: 0
Physical Layer Protocol Subtype: 0
Control Channel MAC Protocol Subtype: 0

Access Channel MAC Protocol Subtype: 0
Fwd Traffic Channel MAC Protocol Subtype: 0
Rev Traffic Channel MAC Protocol Subtype: 0
Key Exchange Protocol Subtype: 0
Authentication Protocol Subtype: 0
Encryption Protocol Subtype: 0
Security Protocol Subtype: 0
Idle State Protocol Subtype: 0
Generic MM Cap Disc Protocol Subtype: 0
Generic Virtual Stream Protocol Subtype: 0
OK

!RSSI?   Received Signal Strength Indication

Syntax: AT!RSSI?

Description: Reports the current RSSI (P(AGC)+Ec/Io) in dBm using a (N-1)/N IIR filter for smoother
display. When no signal is present it reports -125. Reported values can be interpreted as
follows:

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

This command is supported in the online command state and in the command state.

!SCPCUSTCONFIG?   Current Session Configuration
Protocol Customer Configuration

Syntax: AT!SCPCUSTCONFIG?

Description: Sets or reads the current Session Configuration Protocol Customer configuration.

Example:

at!scpcustconfig?
1 - Custom Configuration is Active

Protocol Subtypes:

1 - Subtype 2 Physical Layer
0 - Enhanced CCMAC
1 - Enhanced ACMAC
1 - Enhanced FTCMAC
0 - Enhanced 3 RTCMAC
0 - Enhanced 1 RTCMAC
0 - Enhanced Idle

Broadcast Subtypes:

0 - Generic Broadcast Enabled

Applications Subtypes:

1 - SN Multiflow Packet App
OK

To set this item, enter 13 hex bytes. Example:

at!scpcustconfig=01,0D,00,00,00,00,00,00,00,01,00,00,00
OK

!SESSIONSTATUS   Current Session Status

Syntax: AT!SESSIONSTATUS=<lower_byte>,<upper_byte>

Description: !SESSIONSTATUS   (Sets the current Session Status)
!SESSIONSTATUS?   (Reads the current Session Status)

Value	Meaning
0	Inactive—there is no session
1	Default—there is a session, but no negotiation has been completed
2	Active—there is a session, and all parameters have had at least one chance to be negotiated

In testing and debugging procedures, it is useful to force the session status to Inactive, so that Session negotiation and configuration occur upon the next power up. For the change to occur, the modem must be reset.

When the HDR session is negotiated, the session status is stored in NV RAM. Upon next power up, if the session status is Active, the session parameters are not renegotiated, unless a new network is acquired.

Example:

at!sessionstatus
HDR Session Status: 2
OK
at!sessionstatus=00,00
OK
at!sessionstatus?
HDR Session Status: 0
OK

!SIPID=   User ID Information for Simple IP Setup

Syntax: AT!SIPID=<user id>

Description: Sets the User ID information for a simple IP setup.

!SIPPWD=   Password Information for Simple IP Setup

Syntax: AT!SIPPWD=<passwrd>

Description: Sets the password information for a simple IP setup.

!SLEEPPARMS   Sleep Parameters

Syntax: AT!SLEEPPARMS

Description: Returns 1xEV-DO Rev. A sleep parameters (slot cycle indexes and sleep periods). Slot cycle timeouts are listed in Julian time format (year month day day-of-week hour:minutes:seconds).

Example 1:

at!sleepparms
Slot Cycle1:3
Slot Cycle2:0
Slot Cycle3:0
Slot Cycle1 Timeout:1980 01 06 6 00:00:00
Slot Cycle2 Timeout:1980 01 06 6 00:00:00
OK

Example 2:

at!sleepparms
HDR Rev. A not currently available
OK

!SSMS=   Send SMS

Syntax: AT!SSMS=<p>,<dest>,[cb],"<text>"

AT!SSMS?   Reports the progress of the last message sent

Description: !SSMS= 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).

The text is enclosed in quotations. The quote character cannot appear in the body text.

Body text over the carrier-defined limit is truncated and sent anyway. Messages of length 228 or greater result in an ERROR.

The query form (!SSMS?) reports the progress of the last message sent.
Possible responses are:

none	No SMS messages being sent.
pending	Message has not left the modem (an attempt to use !SSMS= again yields an ERROR result code.)
sent	Successfully sent to the network.
failed	Sending failed and should be retried.

If you send a second message after receiving the "sent" response for the first message, subsequent queries will report the status of the second message.

!STATUS   Status of the Modem

Syntax: AT!STATUS

Description: Reports the modem's status as follows:

> Current band: <band>
> Current channel: <chan>
> SID: <sid> NID: <nid> 1xRoam: <n>
> HDRRoam: <n>
> Temp: <temp> State: <state> Sys Mode:<mode>
> Pilot [NOT] acquired
> Modem has [NOT] registered
> HDR revision: <HRD_rev>

<band> is either OFFLINE, PCS CDMA, Cellular CDMA, PCS Sleep, Cellular Sleep, HDR PCS, HDR Cellular or GPS

<n> for the roaming indicator. Values larger than 2 indicate ERI usage; to obtain the ERI banner, icon state, and icon image, parse the carrier's ERI file.

<temp> is the radio temperature in degrees C.

<mode> is either NO SRV, CDMA, HDR or GPS

NOT appears if the pilot has not been found or the modem has not registered.

<HRD_rev> is displayed only if the modem has 1xEV-DO service.
The value is either 0 or A. See also +CSS? (Serving System).

!SUFWDCCSTATS Current Single User Forward Channel Statistics on DRCs

Syntax: AT!SUFWDCCSTATS

Description: Reports the current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Control Channel; (columns are tab separated).

!SUFWDRESET resets the data reported by this command.

Example:

at!sufwdccstats
FORWARD CONTROL CHANNEL - Early Termination
Slot Count
1 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16
DRC0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
DRC1 0 0 0 0 0 0 0 0
OK

!SUFWDCRCS Current Single User Forward Channel Statistics on CRCs

Syntax: AT!SUFWDCRCS

Description: Reports the current Single User Forward Channel Statistics (Single User packet CRCs and Packet Error Rate).

!SUFWDRESET resets the data reported by this command.

Example:

at!sufwdcrcs

FORWARD TRAFFIC CHANNEL		
	Good CRCs	Bad CRCs
DRC0	0	0
DRC1	0	0
DRC2	0	0
DRC3	0	0
DRC4	0	0
DRC5	0	0
DRC6	0	0
DRC7	0	0
DRC8	0	0
DRC9	0	0
DRC10	0	0
DRC11	0	0
DRC12	0	0
DRC13	0	0
DRC14	0	0
FORWARD CONTROL CHANNEL		
	Good CRCs	Bad CRCs
DRC0	0	0
DRC1	0	0

Packet Error Rate (%): 0.000
OK

!SUFWDRESET   Resets Data

Syntax: AT!SUFWDRESET

Description: Resets the data reported by !SUFWDCCSTATS, !SUFWDCRCS, and !SUFWDTCSTATS.

!SUFWDTCSTATS   Current Single User Forward Channel Statistics

Syntax: AT!SUFWDTCSTATS

Description: Current Single User Forward Channel Statistics (Single User packet early slot termination count for all supported DRCs on Forward Traffic Channel).

!SUFWDRESET resets the data reported by this command.

Example:

```
at!sufwdtcstats
FORWARD TRAFFIC CHANNEL - Early Termination
Slot Count
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16
DRC0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
DRC1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
DRC2 0 0 0 0 0 0 0 0
DRC3 0 0 0 0
DRC4 0 0
DRC5 0 0 0 0
DRC6 0
DRC7 0 0
DRC8 0 0
DRC9 0
DRC10 0 0
DRC11 0
DRC12 0
DRC13 0 0
DRC14 0
OK
```

!SYSTIME?   CDMA Time

Syntax: AT!SYSTIME?

Description: Queries the CDMA time. If the modem has not acquired a system, then the system time may not be available; some time in 1980 is displayed.

The format is:
YYYYMMDDWHHMMSS (W is day of week, 0=Monday)

For example:
200309183180142 = Thursday, Sep 18, 2003, 18:01:42

Chapter 4 – $ Prefix Commands

$QCCAV   Answer Voice

Syntax: AT$QCCAV

Description: (Voice builds only). Answers an incoming call as a voice call. Use –SPKMUT (Speaker Mute) to manually turn off mute on the audio path before answering the call.

Contrast with A (Answer).

See also +CDV (Dial Voice) and +CHV (Hang-up Voice).

$QCMIP   Mobile IP (MIP) Behavior

Syntax: AT$QCMIP

Description: Sets the Mobile IP (MIP) behavior.

Value	Meaning
0	Mobile IP disabled. Simple IP only.
	Mobile IP preferred.
1	In the initial MIP registration, if the network does not support Mobile IP, then the mobile automatically reverts to Simple IP. However, if a Mobile IP session is registered and then the mobile enters a network that does not support Mobile IP, the mobile will drop the session and inform the upper layers of the failure.
2	Mobile IP only.
	The mobile will make data calls only when Mobile IP is supported in the network. During a MIP session, if the mobile hands off to a network that does not support MIP, then the mobile will drop the session and inform the upper layers of the failure.

If a connected data device wants to use its own Mobile IP implementation, the mobile's IP implementation should be disabled by setting AT$QCMIP to 0.

$QCMIPEP   Enables/Disables the Currently Active Mobile IP User Profile

Syntax: AT$QCMIPEP

Description: Enables/Disables the currently active Mobile IP user profile.

Value	Meaning
0	To disable the currently active profile, use AT$QCMIPEP = 0.
1	To enable the currently active profile, use AT$QCMIPEP = 1.

See also $QCMIPP.

$QCMIPGETP   Query a User Profile

Syntax: AT$QCDMIPGETP

Description: $QCDMIPGETP = 1-5 (profile number).The command returns the following parameters for the selected profile:

- NAI
- Home Addr
- Primary HA
- Secondary HA
- MN-AAA SPI
- MN-HA SPI
- Rev Tun (Reverse Tunneling)
- MN-AAA SS
- MN-HA SS

If a profile number is not entered, then the AT command returns all the information corresponding to the currently active profile.

$QCMIPNAI   Set the Network Access ID (NAI) for the Currently Active Profile

Syntax: AT$QCMIPNAI

Description: Sets the Network Access ID (NAI) for the Currently Active Profile:

AT$QCMIPNAI= "user@domain", 0 or 1

Value	Meaning
0	Do not store in NOVRAM
1	Store in NOVRAM

The double quotes (" ") are required only if the string contains a comma.

$QCMIPP   Select One of the Mobile IP User Profiles to Be the Current Active Profile

Syntax: AT$QCMIPP

Description: AT$QCMIPP can be used to configure specific dial-up for various user profiles.

AT$QCMIPP = 1-5 (profile number)

To enable/disable a currently active profile, see $QCMIPEP.

$QCVAD= Sets or Reads the Mode for Answering Data Calls

Syntax: AT$QCVAD=<n> (Set Command)

AT$QCVAD?   (Read Command)

Description: $QCVAD= sets the mode for answering data calls with A (Answer) or auto answer via S0=1.

$QCVAD? reads the mode for answering data calls with A (Answer) or auto answer via S0=1.

Value	Setting
0	OFF (answer as voice). Default.
1	Fax (Fax not supported) for next call, then revert to OFF (voice)*
2	Fax (Fax not supported)for all calls
3	Async data for next call, then revert to OFF (voice)*
4	Async data for all calls

*Reverting to voice happens at the first of these events:

- An incoming call arrives (answered or not)
- Ten minutes elapse without receiving a call
- The modem is reset (or power-cycled)
- The setting is changed by command

The CDMA network requires the call type to be negotiated before the call is answered. This command sets the call negotiation the modem makes prior to answering.

Chapter 5 – & Prefix Commands

&C Data Carrier Detect Control

Syntax: AT&C[n]>

Description: This determines the behavior of the Data Carrier Detect (DCD) signal to the host (DTE) in response to the presence of a connection.

Value	Setting
0	DCD is always ON
1	DCD reflects state of connection.
2	Unix-compatible DCD control. DCD is always ON except for a short time (-1 s) when the carrier is lost. Default.

&D Data Terminal Ready Options

Syntax: AT&D[n]>

Description: Determines what actions the modem takes in response to the Data Terminal Ready (DTR) signal from the host (DTE). For action to be taken, DTR must be off for a period of 2–10 milliseconds.

Note: This command has no impact on the use of DTR to terminate a voice call on the modem, nor does it affect the use of DTR to control modem shutdown.

Value	Setting
0	Ignore DTR
1	Enter command state for an on-to-off DTR transition. The modem condition (on or offline) is not affected. (Currently not supported.)
2	Hang up and enter command state for an on-to-off DTR transition. Auto-answer is disabled if DTR is off. Default.

&F Factory Settings Restore

Syntax: AT&F

Description: Reloads the factory-stored default configurations into active memory. For information on factory settings, see the Stored Profile Settings Table later in this manual.

This command is functionally the same as Z (Reset). If there is an active call, the command executes and the call is dropped.

&V View Configuration

Syntax: AT&V[n]

Description: Displays the active profile (commands and S-register contents).

Any numeric parameter is ignored.

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Chapter 6 – +A Prefix Commands

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+ATINIT=   AT Initialization

Syntax: AT+ATINIT=<cmd>[,C|T[,s[,c]]]   (Stores the current initialization string)

AT+ATINIT?   (Queries the modem for the current initialization string)

Description: This command is used to store an AT command string into the modem or query the modem for the current initialization string. If the initialization string is not empty, the AT commands in this string are executed when the modem is powered on or reset. If the initialization string is empty, no AT commands are executed upon modem startup.

The AT+ATINITSTATE command is used to enable or disable the execution of the command stored by +ATINIT upon modem startup. This allows you to temporarily disable the execution of the initialization string without losing the setting of the stored string.

Based on the optional mode parameter (C or T), the command string (cmd) is either stored or executed as a test.

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

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

Example 1:
> AT+ATINIT=+GMR,c
>
> Stores the single command "+GMR" to report the revision of the firmware.

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

+ATINITSTATE=   AT Initialization State

Syntax: AT+ATINITSTATE=<n>   (Enables/disables the automatic execution of the initialization string)

AT+ ATINITSTATE?   (Queries initialization state)

Description: This command is used to enable or disable the automatic execution of the startup initialization string set using AT+ATINIT. This allows you to temporarily disable the execution of the initialization string without losing the setting of the stored string.

Value	Meaning
0	Disables the execution of the initialization string on startup. Default.
1	Enables the automatic execution of the initialization string on modem startup.

Chapter 7 – +C Prefix Commands

+CAD?   Analog or Digital Service

Syntax: AT+CAD?   (Read-only) (local only)

Description: 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

Syntax: AT+CBC?   (Read-only) (local only)

Description: Reports the power source and battery level in the form +CBC: status, level.

Only the AirCard 595U USB modem has an internal battery.

The other products do not have an internal battery, so they always return a value of +CBC: 1,0 — meaning it is connected to external power.

+CBIP?   Base Station IP Address (Read-only)

Syntax: AT+CBIP?   (Read-only) (local only)

Description: Reports the IP address (in dotted-decimal format) of the Base Station if there is a currently active call. If there is no active call, the following response is returned:

    0.0.0.0
    OK

See also +CMIP (Mobile IP Address).

+CDV   Dial Voice

Syntax: AT+CDV [options]

Description: Initiates a voice call. Because of the options available in this command, another AT command cannot follow it on the same line. All characters following the +CDV command are taken as parameter options. For a list of dialing option parameters and restrictions, see the D (Dial) command. The options available are the same as those described for async data dialing.

Voice dialing leaves the modem in command state. This allows use of commands to control microphone and speaker options, and to generate DTMF tones if needed.

See also +CHV (Hang-up Voice).

+CFG= Configuration String

Syntax: AT+CFG="<str>" (Sets a configuration)

AT+CFG? (Reads a configuration)

Description: This command sets a configuration string of up to 248 characters. The string parameter must be enclosed within quotation marks (0x22). You cannot append any other commands after it in the same command line.

This string is transmitted to the Base Station as the last step of establishing the transport layer of the airlink. The default setting is null. Any setting replaces the previous value.

+CGCAP Get IWF Capabilities

Syntax: AT+CGCAP

Description: Requests the IWF to send one or more lines of text containing AT+ commands which indicate the additional capabilities of the IWF. This is used to determine if services the user needs (such as +CIS707, +MS, +ES, +DS, and +FCLASS) can be performed by the IWF.

For details on parameters and use, see IS-131.

If the modem is not registered for service, the ERROR result code is returned.

See also +GCAP (Get Capabilities).

+CGMI Get IWF Manufacturer

Syntax: AT+CGMI

Description: 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

Syntax: AT+CGMM

Description: 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

Syntax: AT+CGMR

Description: 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).

+CGOI   Get IWF ISO ID

Syntax: AT+CGOI

Description: Requests the IWF to send one or more lines of text determined by the manufacturer of the IWF to identify the device based on the ISO system of registering unique object identifiers. Typically this is a numeric string delimited with periods.

If the modem is not registered for service, the ERROR result code is returned.

See also +GOI (Get ISO ID).

+CGSN   Get IWF ESN

Syntax: AT+CGSN

Description: 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).

+CHV   Hang-up Voice

Syntax: AT+CHV [0]

Description: Terminates a voice connection previously established with +CDV (Dial Voice) or $QCCAV (Answer Voice). The only valid parameter is zero, which is optional.

See also H (Hook Control).

+CMIP?   Mobile Station IP Address

Syntax: AT+CMIP? (Read only)

Description: 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).

+CMUX= Multiplex Option

Syntax: AT+CMUX=<f[,r]> (Sets the Multiplex Option)

AT+CMUX? (Reads the Multiplex Option)

Description: 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= Command State Inactivity Timer

Syntax: AT+CQD=<n> (Sets the Command State Inactivity Timer)

AT+ CQD? (Reads the Command State Inactivity Timer)

Description: 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= Cellular Result Codes

Syntax: AT+CRC=<n> (Enables or disables cellular result codes)

AT+CRC? (Reads the cellular result code value)

Description: 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 Extended Cellular Result Codes Table.

Extended cellular call progress codes are in the Extended Cellular Call Progress Codes Table later in this manual.

+CRM= Local (Rm) Interface Protocol

Syntax: AT+CRM=<n> (Sets the Local Interface Protocol)

AT+CRM? (Reports the protocol for local (DCE - DTE) interface.

Description: Reports (or sets) the protocol for the local (DCE - DTE) interface. This value is set automatically by the modem, based on the data received.

Value	Meaning
0	Asynchronous Data or Fax (Default)
1	Packet data service, Relay Layer interface

+CSQ? Signal Quality

Syntax: AT+CSQ? (Read-only)

Description: 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

Syntax: AT+CSS? (Read-only)

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

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

<band>	Meaning
A - F	Registered on a band system indicated.
Z	Not registered system Meaning
0–32767	System ID of the network that the modem is currently registered with.
99999	Modem is not registered.

See also !STATUS (Status).

+CTA=   Packet Data Inactivity Timer

Syntax: AT+CTA=<n>   (Sets the Packet Data Inactivity Timer)

AT+CTA?   (Reads the value)

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

The modem maintains the PPP session with the local host, and the network retains the PPP session at its end, only the intervening "physical link" layer is dropped. The modem restores the link when traffic resumes.

Each unit represents 1 second.

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

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

See also +CQD (Command State Inactivity Timer).

+CXT=   Cellular Extension

Syntax: AT+CXT=<n>   (Enables/disables the passing of unrecognized AT commands)

AT+ CXT?   (Reads the value)

Description: 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 pass through state.

Use H0 (on-hook) to close the airlink.

Value	Meaning
0	Do not pass unrecognized commands. (Default)
1–255	Open a transport layer connection and pass the unrecognized command to the IWF.

Chapter 8 – +F Prefix Command

+FCLASS= Modem Operating State

Syntax: AT+FCLASS=[n]

Description: Sets the modem's data state.

Value	Setting
0	Data. Default

Note: Fax is not supported.

Chapter 9 – +G Prefix Commands

+GCAP   Get Capabilities

Syntax: AT+GCAP

Description: Reports the modem's additional capabilities in one or more lines of text containing AT+ commands. This is used to determine if services the user needs can be performed by the modem. The services and commands reported can be any or all of:

Response	Description (related commands)
+FCLASS	Fax support (Fax not supported)
+MS	Modulation control (+MS, +MR)
+MV18S	V.18 modulation control (+MV18S, +MV18R)
+ES	Error control (+ES, +EB, +ER, +EFCS, +ETBM)
+CIS707-A	IS-707-A (High Speed Packet Data Services)
CIS-856	IS-856 (High Rate Packet Data Air Interface)
+DS	Data compression (+DS, +DR)

See also +CGCAP (Get IWF Capabilities).

+GMR   Get Revision

Syntax: AT+GMR

Description: Reports the modem firmware version: revision level (see the following paragraphs) and date, followed by the version for the Preferred Roaming List (PRL) in use. It also reports the hardware revision.

Example of interpreting the firmware revision level: p2006001:

P: Production release

The next two digits indicate the product ID:

Value	Product
19	AirCard 595
20	MC5725, MC5725V, AirCard 595U
21	AirCard 597E
23	Compass 597
24	MC5727, MC5727V
25	USB 598
27	AirCard 402
28	MC5728V

The next three digits indicate the firmware build version: for example, 060 corresponds to firmware build version 0.60.

The next two digits (in some cases, four) indicate the point release within the above build version. In our example, 06001 means point release .01 in firmware build 0.60.

The command also returns version information on some or all of the following:

	Description
QCOM	Boot images
BOOT	SWI Boot Loader: Product/product family description (for example, SWI6800 or SWI6800V2), followed by:

- "FP" (Full Production), "FD" (Full Development), or "PP" (Point Production)
- Major revision number (2 digits)
- Minor revision number (2 digits)
- Point release number (optional)

Note: Depending on the modem model, the above information may not apply.

APPL	Application code
SWOC	Software on Card image: "CDPC", followed by the 5-digit decimal CDPC (CD Product Code), followed by the CD version:

- Major revision number (2 digits)
- Minor revision number (2 digits)
- Point release number (2 digits)

USBD	USB descriptor table
USB VID	USB Vendor ID

Examples with Interpretation of Each Line of the Modem's Response:

AT+GMR

p2110100,5077 [Aug 07 2007 14:29:37]
> **Production Release** (p) for AirCard 597E. Firmware version 1.01. Point release 00.

QCOM: SWI6800V2_FD.00.32
> **Boot Image:** SWI6800V2 family. Full Development (FD). Major revision 00. Minor revision 32.

BOOT: SWI6800V2_FP.01.01 2007/08/09 10:37:43
> **SWI Boot Loader:** SWI6800V2 family. Full Production (FP). Major revision 01. Minor revision 01. Build date Aug 9, 2007.

APPL: SWI6800V2_FP.01.01 2007/08/09 10:37:43
> **Application Code**: SWI6800V2 family. Full Production (FP). Major revision 01. Minor revision 01. Build date Aug 9, 2007.

USBD: SWI6800V2_GENERIC.00.00
> **USB Descriptor Table:** SWI6800V2 family. Generic build. Major revision 00. Minor revision 00.

SWOC: CDPC_00004_01.01.02
> **Software on Card image**, CDPC (CD Product Code) = 00004. CD version: major revision 01, minor revision 01, point release 02.

USB VID: 0x1199 PID: 0x0021
> **USB Vendor ID** 0x1199; product: AirCard 597E (21).

See also +CGMR (Get IWF Revision) and I (Product Identification Information).

+GMI   Get Manufacturer

Syntax: AT+GMI

Description: Reports the modem's manufacturer.
                 See also +CGMI (Get IWF Manufacturer).

+GMM   Get Model Number

Syntax: AT+GMM

Description: Reports the modem model.
                 See also +CGMM (Get IWF Model).

+GOI   Get ISO ID

Syntax: AT+GOI

Description: Reports the modem's ISO system registration code (if any). The code provides a method of uniquely defining an object. The Sierra Wireless modems have no ID string (null).
                 See also +CGOI (Get IWF ISO ID).

+GSN   Get ESN

Syntax: AT+GSN

Description: Reports the modem's electronic serial number. The modem reports an eight character ASCII string of hexdigits (no spaces).
                 See also +CGSN (Get IWF ESN).

Chapter 10 – +I Prefix Commands

+ICF= Character Framing

Syntax: AT+ICF=<[f],[p]>
AT+ICF?   (Queries the settings)

Description: Settings with this command are ignored. Normally, this command sets the local serial port (DTE - DCE) connection character framing.
The modem uses a true serial interface, but the modem's support is limited to:
8-bit data
1 stop bit
no parity (the parity setting is ignored)
Note: These are the default values.

Parm	Value	Meaning
f (format)	3	8 data bits, 1 stop bit (no other values are permitted)
p (parity)	0–3	value is ignored

See also +IPR (Fixed Port Rate).

+ILRR Local Rate Reporting

Syntax: AT+ILRR[=0]
AT+ILLR?   (Queries the settings)

Description: Enables and disables the reporting of the local rate to the host (DTE).
Note: The modems do not support local rate reporting. This command is provided for compatibility only and only accepts a setting of 0 (off).

+IPR= Fixed Port (Rm) Rate

Syntax: AT+IPR=<n>
AT+IPR?   (Queries the settings)

Description: Sets a data rate for the local serial port (DTE - DCE).
The modem supports the following rates:

300	1200	4800	19200	57600	230400
600	2400	9600	38400	115200	

Chapter 11 – +M Prefix Commands

+MA= Modulation Auto Mode

Syntax: AT+MA=<str>

AT+MA? (Queries the settings)

Description: Sets the additional modulations that the Base Station may use to connect with the destination modem in Auto Mode operation. This is used for originating and answering operations on data calls and is additional to the modulation setting using the +MS (Modulation Selection) command.

The default setting is null.

For details on parameters and use, see IS-131.

+MR= Modulation Reporting

Syntax: AT+MR=<n>

AT+MR? (Queries the settings)

Description: Enables or disables the extended intermediate result codes for +MCR:<carrier> and +MRR:<rate>[,rx_rate] from the IWF to the modem. For details on the intermediate result codes possible, see IS-131.

To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). 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= Modulation Selection

Syntax: AT+MS=<parms>

AT+MS? (Queries the settings)

Description: Controls the manner and operation of the modulation capabilities in the IWF. To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MS result must be in that response.

The default setting is null.

For details on parameters and use, see IS-131.

+MV18R= V.18 Reporting

Syntax: AT+MV18R=<n>

AT+MV18R?   (Queries the settings)

Description: Enables or disables the extended result codes for +MV18R: from the IWF to the modem.

To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MV18S result must be in that response.

Value	Meaning
0	Disables reporting of V.18 result codes. Default.
1	Enables reporting.

The possible intermediate result codes are:

+MV18: 5BIT	Indicates connection with 5-bit (Baudot) mode
+MV18: EDT	Indicates connection with EDT
+MV18: DTMF	Indicates connection with DTMF
+MV18: V21	Indicates connection with V.21
+MV18: V23	Indicates connection with V.23
+MV18: B103	Indicates connection with Bell 103-type modulation
+MV18: V18	Indicates connection with V.18

+MV18S= V.18 Selection

Syntax: AT+MV18S=[m],[ans],[fb]

AT+MV18S?   (Queries the settings)

Description: Controls the manner and operation of the V.18 capabilities in the IWF (if present in the IWF).

To query the IWF for confirmation that the command is supported, use +GCAP (Get Capabilities). The +MV18S result must be in that response.

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 mode
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.

Chapter 12 – +W Prefix Commands

+WGETWK   Request Wake-Up Reason

Syntax: AT+ WGETWK

Description: Responds with the reason of the last wake-up event. The response is a decimal digit representing the bit-mask below.

If no events have triggered, the response is a zero.

Value	Meaning If Set to This Value
0	No event
1	Ring received
2	Radio coverage restored
2	SMS message received

+WWKUP=   Wake-Up Events Mask

Syntax: AT+WWKUP=<n>
AT+WWKUP?   (Reports the settings)

Description: Sets or reports the bit-mask used to identify events that generate a wake-up from the modem to the host device. A setting of zero disables all wake-up signals. The default setting is 5; wake on ring and SMS received.

When this command is issued, the last wake-up event reason (see +WGETWK on page 76) is reset to 0.

Bit	Meaning when set 0 Wake-up on ring received (Default is set)
1	Wake-up on radio coverage restored (Default is clear)
2	Wake on SMS received (Default is set)
3 – 7	Reserved

Chapter 13 – No Prefix Commands

+++ Escape

Syntax: +++

Description: The +++ Escape Sequence is not preceded by AT. Applies only to asynchronous calls.

Used to exit data state and enter command state; this is not preceded by AT and does not require <CR>.

The escape character is fixed as the plus sign "+" (0x2B). The guard time between normal transmission data and the escape sequence is specified as 1 second and cannot be changed. Therefore, the modem requires a minimum of 1 second of inactivity on the serial input, three plus sign characters, followed by 1 second of inactivity.

If a PPP session is active, then use PPP to escape data state.

A/ Repeat Last Command

Syntax: ATA/

Description: The ATT Repeat Last Commands not preceded by AT. The last command string entered is executed again. The previously executed command remains in the command buffer until AT is entered or the modem is reset or power-cycled.

This command does not require the AT prefix or a <CR> at the end. It executes immediately on entry of the slash character.

A Answer (Manual)

Syntax: ATA

Description: Instructs the modem to immediately go off-hook and attempt to establish a connection without waiting for a ring. This is used to answer an incoming call if auto answer (S0) is disabled.

The command presumes a RING has been received. If the command is issued without a RING, behavior depends on the state. If the modem is in command state, it replies with OK and remains in command state. Should the modem be in pass through state without a call pending, the Answer command is sent to the IWF modem. This typically goes off-hook and looks for the carrier. When none is detected, the NO ANSWER or NO CARRIER result is returned. This is, however, dependent on the IWF modem.

The modem looks for the carrier to negotiate the connection and issues either:
- CONNECT and enters data state; or,
- NO CARRIER and remains in command state.

D Dial

Syntax: ATD

Description: Initiates a data call. To dial a voice call, use +CDV.

Because of the options available in this command, another AT command cannot follow it on the same line. All characters following the D command are taken as parameter options.

Several types of data calls are possible, based on the option(s) entered.

Packet Data Calls

Traditional CDMA data call dialing uses the parameter "#777". This triggers the modem to try a connection using the detected service type: 1X or QNC (IS-95). It is possible that 1X service may be detected in an area that offers 1x voice service, but only IS-95 data service. The use of passwords can differ between a QNC and 1X call on some networks as well. In these situations the call is likely to fail.

You should force the modem to attempt one service type or the other by using dedicated dial strings dictated by the carrier. Typically (but not in all cases) the strings are:

- #762 "QNC" – Connect to QNC using IS-95 service
- #19788 "1XRTT" – Connect PPP using 1X service

Your connection software must manage use of the correct password for the type of service used.

Async (CSC) Data

The type of call opened depends on the setting of +FCLASS. The modem does not actually dial the number in the string. For an IS-95 call, the dial string is passed to the IWF where a modem there issues the dial over the PSTN. Prior to passing the dial command, the modem sends the IWF modem the string defined in +CFG (Configuration String) to configure the IWF modem for the call.

For dialing an async data call, the parameter string options are included on one command line with or without spaces. There is a limit of 35 characters in the dial options string. Upon successful answer and connection, the modem goes into data state. There is a time limit set in register S7

(Wait for Carrier) for the entire process.

The options listed below are commonly supported, but specific IWF modem capabilities govern the list of supported parameters.

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). See the table of possible result codes later in this manual.

E Echo

Syntax: ATE[n]

Description: Controls echoing of characters received from the host (DTE) back to the host when in command state. This also affects framing of responses. For details, see "Framing".

Value	Setting
0	Disable echo
1	Enable echo. Default.

H Hook Control

Syntax: ATH[0]

Description: Go ON-Hook to disconnect a data/fax call. (To end a voice call, use +CHV)

If the modem was already on-hook, no change is made. The only parameter allowed is 0 (zero), which is optional. The modem goes from online condition to offline condition.

See also +CHV (Hang-up Voice).

I Product Identification Information

Syntax: ATI

Description: Shows Product Identification Information.

Note: Depending on your modem model, the types of information may vary.

Example:

```
ATI
Manufacturer: Sierra Wireless, Inc.
Model: C597 Rev 1.0 (2)
Revision: p2314500,4012 [Mar 06 2008 17:19:08]
```

For information and examples on interpreting the (firmware) Revision, QCOM and other return values, see +GMR.

```
QCOM:       SWI6800V2_FD.00.32
BOOT:       SWI6800V2_FP.01.45 2008/03/07 16:36:13
APPL:       SWI6800V2_FP.01.45 2008/03/07 16:36:13
USBD:       SWI6800V2_GENERIC.00.01
SWOC:       CDPC_00005_01.01.01
USB VID:    0x1199 PID: 0x0023
ESN:        0x60684203
+GCAP:      +CIS707-A, CIS-856, CIS-856-A, +MS, +ES, +DS, +FCLASS
See +GCAP.
SKU:        0x2BAF
```

L Loudness (Speaker Volume)

Syntax: ATL[n]

Description: This command is provided for compatibility reasons; the modem takes no action. Parameters are ignored.

For control of voice mode speaker levels, see -SPKVOL.

M   Mute (Speaker Control)

Syntax: ATM[n]

Description: This command is provided for compatibility reasons; the modem takes no action. Parameters are ignored.

For control of voice mode microphone and speaker muting, see –MICMUT and -SPKMUT.

O   Online (Remote)

Syntax: ATO

Description: Currently not supported.

Causes the modem to go from command state (online condition) to data state. The modem responds with the normal CONNECT response codes (if enabled) as if the connection were new.

This command is executed by the IWF modem. If the CDMA modem was in an offline condition and without an airlink, the NO CARRIER and OK result codes are returned. If the modem was offline and the airlink was established (pass through 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

Syntax: ATP

Description: This command is provided for compatibility reasons; the modem takes no action.

Q   Quiet (Result Code Display Option)

Syntax: ATQ[n]

Description: 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›=   S-Register Set/Query

Syntax: ATS<n>=<x> (Sets S-Register)

ATS<n>? (Queries S-Register)

Description: Sets or queries the contents of the specified S-register (n) to the new value (x). Where parameter values are omitted, zeros are assumed.

Var.	Range
n	Valid S-register number (for values, see the Table of S-Registers later in this manual.
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.

T   Tone (Set DTMF Dialing)

Syntax: ATT

Description: This command is provided for compatibility reasons; the modem takes no action. For information on DTMF tone generation on the modem. See –DTMFB, -DTMFK, -TONDUR, and -TONMUT.

V   Verbose (Result Code Form)

Syntax: ATV[n]

Description: Specifies whether the modem displays the result codes in numeric format or as words (verbose). For a numerical list of the Table of Result Codes later in this manual.

Note that numeric codes are returned as ASCII character numerals.

This command also affects framing of responses. For details, see "Response framing".

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   Result Code Select/Call Progress Control

Syntax: ATX<n>

Description: 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	No Dial Tone	Busy Signal	
1	✗	✗	
2	✓	✗	
3	✗	✓	
4	✓	✓	Default

Z   Profile Restore

Syntax: ATZ

Description: The modem goes on-hook (drops any active call) and then resets the command and register parameters to the defaults.

For information on factory settings, see the Table of Stored Profile Settings later in this manual.

Chapter 14 – - Prefix Commands

-DTMFB= DTMF Burst

Syntax: AT-DTMFB=<key1> [<key2>,<key3>,…]

Description: Generates a string of DTMF tones under the timings defined by -TONDUR (Tone Duration). This command can be overridden by -TONMUT (Tone Mute). The values of <key> can be any of 0–9, *, and #, up to a total of 32 keys. Spaces, quotes, brackets, dashes, and commas are not permitted in the string.

-DTMFK= DTMF Key

Syntax: AT-DTMFK=<key>

Description: Generates a single key DTMF tone for the duration set by -TONDUR (Tone Duration). This command can be overridden by -TONMUT (Tone Mute). The values of "key" can be any of 0–9, *, and #.

-ECHO= Echo Cancellation Level

Syntax: AT-ECHO=<n>   (Sets Echo Cancellation Level)
AT-ECHO?   (Queries Echo Cancellation Level)

Description: Sets and queries the environment for the echo cancellation profile. The modem has five environments available.

The setting is stored in non-volatile memory.

Parm	Meaning
0	Factory default (headset) (same as 3) (Default)
1	No echo cancellation
2	Handset
3	Headset
4	Acoustic (AEC)
5	Speaker-phone

-HDSET= Headset Detection Option

Syntax: AT-HDSET=<n> (Sets Headset Detection Option)

AT-HDSET? (Queries Headset Detection Option)

Description: Sets and queries the detection option for the voice headset. The setting is stored in non-volatile memory.

Parm	Meaning
0	Do not use headset detection. Always report "not inserted" via CnS message.
1	Do not use headset detection. Always report "inserted" via CnS message. Default.
2	Use headset detection. Report current headset detected state via CnS message.

There is no AT command to report whether a headset is detected when setting 2 is used. Headset detection is only reported via CnS messages.

-MICMUT= Microphone Mute

Syntax: AT-MICMUT=<n> (Sets Microphone Mute)

AT-MICMUT? (Queries Headset Detection Option)

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

Parm	Meaning
0	Microphone mute is OFF. Default.
1	Mute is ON

-NAMLCK= NAM Lock

Syntax: AT-NAMLCK=<n>

Description: Stores a pass code number for comparison to the modem's 6-digit OTSL (One Time Subsidy Lock), MSL (Master Subsidy Lock), or SPC (Service Provisioning Code). The service provider provides this number to you at the time of service activation.

If the number is an acceptable format, the OK result code is returned. If the parameter's format is rejected (such as too many digits), the ERROR result is returned.

The actual comparison of the pass code entered with this command and the lock codes encoded in the modem does not take place until an attempt is made to write a NAM profile account using -NAMVAL.

-NAMVAL= NAM Values

Syntax: AT-NAMVAL=<nam> [,<MDN>,<MIN>,<SID>,<NID>] (Set command)

AT-NAMVAL?<nam>   (Reads the current account information)

Description: This command has three functions related to the account or NAM (Number Assignment Module):

Set the Active Account Index

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

Read the Current Account Information

The query form of the command will report the details of the specified account (0):

MDN: 9999999999	(10 digit phone number)
MIN: 9999999999	10-digit MIN (encoded and stored into MIN1 and MIN2)
SID: 99999	(System ID)
NID: 99999	(Network ID)

Write Account Activation Data

This form requires the optional parameters. The modem will first compare the pass code stored using –NAMLCK (page 84). If the pass code fails to match, the ERROR result is returned. If the OK result is received, the NAM profile account was successfully activated.

The parameter values are as noted for the query form of the command. The service provider will tell you what numbers to enter for NUM, MIN, SID, and NID.
NAM must be 0.

Following writing the values, the modem must be reset to have the values take effect.

-RESET   Soft Reset

Syntax: AT-RESET

Description: Resets the modem gracefully, shutting down any active connection. The modem issues the OK result before completing the reset cycle. The reset is complete after approximately 5–15 seconds, after CTS has been deasserted and then reasserted.

-SHTDWN   Shutdown

Syntax: AT-SHTDWN

Description: Forces the modem into a shutdown state, gracefully closing any open connection. This shutdown is deeper than the one achieved by using the control signals on the modem; it includes closing the serial connections.

Following this command, the modem can be restarted only by power cycling or a hardware reset.

The Shutdown Acknowledge control line is asserted when the shutdown is complete.

-SPKMUT= Speaker (Headset) Mute

Syntax: AT-SPKMUT=<n> (Set command)

AT-SPKMUT? (Query command)

Description: Sets and queries the state of the speaker mute. This value is not stored in non-volatile memory. The setting is considered temporary, and reverts to the default (OFF) when a new call is started, or the modem is power cycled, reset, or when the profile is restored (&F and Z).

Parm	Meaning
0	Speaker mute is OFF. Default.
1	Mute is ON

Note: This setting does not affect the setting of –SPKVOL (Speaker Volume).

-SPKVOL= Speaker (Headset) Volume

Syntax: AT-SPKVOL=<n> (Set command)

AT-SPKVOL? (Query command)

Description: Sets and queries the volume level of the voice circuit speaker.

The value is stored in non-volatile memory, making it persistent across resets and power-cycles.

Parm	Meaning
0	muted
1	-20 dB
2	-16 dB
3	-12 dB (Default)
4	-18 dB
5	-4 dB
6	0 dB

-STGLVL= Side Tone Gain Level

Syntax: AT-STGLVL=<n> (Set command)

AT-STGLVL? (Query command)

Description: Sets or queries the amount of side tone gain; that is the volume of the speaker's own voice (microphone input) that is presented to the earpiece (speaker output).

Parm	Meaning
0	-84 dB
1	-36 dB
2	-32 dB (Default)
3	-28 dB
4	-24 dB
5	-20 dB
6	-16 dB

-TONDUR=   Tone Duration

Syntax: AT-TONDUR=<key,on,off>   (Set command)

AT-TONDUR?   (Query command)

Description: Sets and queries the timing, in milliseconds, for generating DTMF tones using single key tones (-DTMFK) and bursts (-DTMFB). Settings are stored in non-volatile memory.

Parm	Range	Meaning
key	100–3000	Key duration for single key tones (-DTMFK)
		Default = 300 ms
on		On time for tones in bursts (-DTMFB)
	95–144	95 ms
	145–194	150 ms
	195–244	200 ms (Default)
	245–294	250 ms
	295–344	300 ms
	345–350	350 ms
off		Off time between tones in bursts.
	60–109	60 ms
	110–159	100 ms (Default)
1	60–200	150 ms

-TONMUT=   Tone Mute

Syntax: AT-TONMUT=<n> (Set command)

AT-TONMUT?   (Query command)

Description: Sets and queries the mute setting on the generation of DTMF tones via -DTMFK and -DTMFB. Settings are stored in non-volatile memory.

Parm	Meaning
0	DTMF mute is OFF (tones can be generated) (Default)
1	Mute is ON

Chapter 15 – 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 of S-Registers

Reg.	Description	Range	Default	Units
0	**Auto answer** The modem auto answers after a delay specified by S0. If S0=0, then auto answer is turned off. The delay is equivalent to [<value> - 1] x 6 seconds. Examples: 1 = no delay 3 = 12 seconds	0–255	000	(n-1)*6 s
3	**Carriage Return Character** The standard end of line character used to indicate the end of an AT command. This character is also used as the carriage return character for framing responses and result codes in command state.	0–127	013 (CR)	ASCII
4	**Line Feed Character** The standard line feed character sent by the modem to the host at the end of a response or return code in command state.	0–127	010 (LF)	ASCII
5	**Backspace Character** This register sets the character recognized as a backspace during command entry.	0–127	008 (BS)	ASCII
6	**Wait for Blind Dial (Remote)** This register denotes the wait time, in seconds, before a blind dial (no dial tone detection). The value of S6 is used when the X (Result Code Select/Call Progress Control) command is set to 1, or 3. X settings of 2 and 4 enable dial tone detection and disable blind dialing. Therefore, when X is set to 2 or 4, the value of S6 is irrelevant.	2–10	002	Seconds
7	**Wait For Carrier (Remote)** If no carrier from the remote modem is detected within the specified time, the modem goes on-hook.	1–255	060	Seconds
8	**Comma Pause Time (Dial Modifier) (Remote)** Whenever a dial command contains the comma character, the contents of this register specify the pause time for each comma.	0–255	002	Seconds
9	**Carrier Detect Response Time (Remote)** Specifies the time that the received carrier must be present for the modem to recognize it and turn on Data Carrier Detect (DCD) if applicable. The implementation is entirely at the IWF modem.	0–255	006	0.1 s

10	**Lost Carrier Hang-up Delay (Remote)**	1–255	014	0.1 s
	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.			
11	**DTMF Dialing Speed (Remote)**	50–255	095	0.001 s
	This specifies the duration of tones in DTMF dialing. This register is not used by the -DTMFB command. See -TONDUR (Tone Duration).			

Chapter 16 – Result Codes

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

Basic Result Codes

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

Extended Cellular Result Codes

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

Code	Verbose	Meaning
11	RING ASYNC	Indicates an incoming CSC call
12	RING FAX	(Fax Not Supported) Indicates an incoming CSC Fax call
13	RING PACKET	Indicates an incoming packet data mode call
21	NO SERVICE	Origination was attempted while the modem was not able to acquire a CDMA Paging Channel
22	NO ASYNC SERVICE	The base station rejected the async service option request
23	NO FAX SERVICE	The base station rejected the fax service option request
25	BAD REQUEST	An intercept was received after call origination
26	PAGED	The modem attempted to originate a call after receiving a page
27	RETRY	Reorder received after call origination
28	PAGE FAIL	The modem received a page but not an alert
29	LINK FAIL	The modem has lost the Traffic Channel
30	RELEASE	The call has been released

Extended Cellular Call Progress Result 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.

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
*	+RING <service mode>	Indicates an incoming call to the modem in the service mode indicated: ASYNC or STU-III (not supported)
* See numbers 11–13 in Table of Extended Cellular Result Codes on previous page		

Chapter 17 – Stored Profile Settings

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

Stored Profile Settings for Commands

Command	Description	Factory Settings
$QCMIP	Mobile IP behavior	Carrier dependent
$QCMIPNAI	Network Access ID (NAI) for the Mobile IP general user profile	Carrier dependent
$QCMIPP	Active Mobile IP user profile	
E	Echo (Command State)	1 (enabled)
L	Loudness - Speaker Control	0 (ignored)
M	Mute - Speaker Control	0 (ignored)
Q	Quiet - Result Code Display Option	0 (Codes returned)
V	Verbose - Result Code Form	1 (Words)
X	Result Code Select/Call Progress Control	4 (all codes)
&C	Data Carrier Detect Control	2 (UNIX wink)
&D	Data Terminal Ready Options	2 (Hang up)
+CFG	Configuration String	(null)
+CMUX	Multiplex Option	C (Forward link) 2 (Reverse link)
+CQD	Command State Inactivity Timer	10 (50 seconds)
+CRC	Cellular Result Codes	0 (disabled)
+CRM	Local (Rm) 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 (Rm) Rate	115200 (ignored)
+MA	Modulation Auto Mode	(null)
+MR	Modulation Reporting	0
+MS	Modulation Selection	(null)
+MV18R	V.18 Reporting	0 (disabled)
+MV18S	V.18 Selection	0, 0, 0

Stored Profile Setting for S-Registers

Command	Description	Factory Settings
S0	Auto-answer mode	0 (disabled)
S3	Carriage Return Character	013 (CR)
S4	Line Feed Character	010 (LF)
S5	Backspace Character	008 (BS)
S6	Wait for Blind Dial (Remote)	002 (2 seconds)
S7	Wait for Carrier (Remote)	060 (60 seconds)
S8	Comma Pause Time (Remote)	002 (2 seconds)
S9	Carrier Detect Response Time (Remote)	006 (0.6 seconds)
S10	Lost Carrier Hang-up Delay (Remote)	014 (1.4 seconds)
S11	DTMF Dialing Speed (Remote)	095 (0.095 s)

Appendix A – Working With the IWF

Introduction

When operating a CDMA modem in IS 95B (CSC) service, the local modem and the IWF modem must work as a team to perform the duties that a traditional wire line 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 modem and the IWF modem co-ordinate their functions without specific user actions.

Local and Remote Commands

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

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

Local Only

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

Shared

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

Remote-only

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

Still other commands are only meaningful if there is an established call because the data involved is transient and only exists in the presence of a call. +CMIP (page 61) is used to query for the current IP address of the modem. The modem is assigned an IP address by the network only when there is an active IS 95B call.

This is an example of another type of remote-only command.

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

Airlink Control

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

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

Establishing the Airlink

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

- Initiate or answer a call. Using ATD to initiate a call or ATA to answer a call causes the local modem to open the link.
- Issue a remote-only command (or any command unrecognized by the local modem) with the modem set using +CXT=1 (Cellular Extension enabled).

  If +CXT=0 (disabled), then the local modem gives the ERROR result code for unrecognized commands. When the cellular extension is enabled, the modem will open the airlink and pass the command to the IWF for processing.

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

Initializing the Airlink

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

The local modem automatically initializes the airlink each time it is opened. The initialization process involves first sending the IWF all needed AT commands to configure it to match the (non-default) settings of the local modem itself. This ensures that both modems are synchronized. The second step to initializing the link is to send the IWF the contents of the +CFG string (page 59). These are commands selected by the user to configure the IWF for a particular operation.

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

Pass through and Reflection

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

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

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

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

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

Appendix C – Acronyms and Definitions

Acronym or Term	Definition
AGC	Automatic Gain Control
Cellular	800MHz radio spectrum air interface
dB	Decibel = 10 x $\log_{10}$ (P1/P2) (Power dB) Decibel = 20 x $\log_{10}$ (V1/V2) (Voltage dB)
dBm	Decibels, relative to 1 mW - Decibel(mW) = 10 x $\log_{10}$ (Pwr (mW)/1mW)
FER	Frame Error Rate – a measure of receive sensitivity
GPS	Global Positioning System—a system that uses a series of 24 geosynchronous satellites to provide navigational data
IS-95	2G radio standards targeted for voice (cdmaONE)
MHz	MegaHertz = 1e6 Hertz (Hertz = 1/second)
PCS	Personal Communication System - PCS spans the 1.9GHz radio spectrum
PDE	Position Determination Entity—the device that the mobile communicates with for assistance in acquiring a GPS location fix
response	A response from the modem that is issued prior to a result code
result code	A numeric or text code that is returned after all commands (except resets)
RF	Radio Frequency
Sensitivity (RF)	Measure of lowest power signal that the receiver can measure

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