Voice +V Commands

Developer's Guide

MultiTech Systems

Voice +V Commands Developer's Guide
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Revision	Date	Description
A	08/08/00	Manual released (replaces PN 82039200). Changes: reformatted; deleted references to BBS and FaxBack services; added Related Manuals and Additional Information links; deleted +FCLASS=<mode>, +FCLASS=?, +VCID and +VDID commands.
B	05/03/04	Corrected unsearchable terms. New format.
C	03/01/10	Minor editorial changes. Changed Technical Support section.
D	10/06/10	Removed set options 8-15 from +VLS command. Only options 1-7 are supported.
E	10/04/12	Added +VLS command options.

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Chapter 1 - Introduction

Introduction

This document describes the enhancements to your MultiModem provided with +V command firmware support. The +V Command standard IS-101 Voice Control Interim Standard for Asynchronous DCE (prepared by the TIA Technical Subcommittee TR29.2 on Facsimile Digital Interface) defines the commands that a PC user may issue to configure and control a voice/fax/data modem, and the responses (result codes) that the voice/fax/data modem may issue in response to those commands.

The +V commands and responses provide control of the following services:

- Recording and playback of digitized voice
- Generation and detection of DTMF and other tones
- Switching between voice, fax, and data modes
- Control-related functions.

The Voice mode has four states that correspond to the direction of voice data flow:

- Voice command state (event reports only; no data transfers)
- Voice transmit state (digitized, half-duplex voice data transfers from PC to modem)
- Voice receive state, (digitized, half-duplex voice data transfers from modem to PC)
- Voice translation state (full-duplex DCE voice format conversion)

The modem supports three levels of voice service: Service Levels A, B, and C. Service Level A provides the lowest level of services. Service level A performs operations and detects events as follows: Voice transmit, Voice receive, and DTMF generation and Single tone generation. The following events (Result Codes) are reported: 3, 4, 5, 6, 9, 10, 18, 19, 23, 25 (refer to Voice Mode Result Codes table).

Service Level B provides an optionally greater amount of services, providing DTMF and facsimile calling tone detection during voice transmits in addition to Service Level A. Service Level B provides event reporting similar to Service Level A, but with added event reporting states (e.g., fax calling in transmit state in addition to reporting in command state).

Service Level C provides the highest service level with the addition of facsimile calling tone and Busy detection during receives, Dial Tone detection, and double-tone detection. An example of event detection in a Service Level C modem is shown below:

```
AT+VEM=?
"C"
0A000100
0E601800
1A803840
OK
```

Note: Commands may vary, depending on the product that you are working with.

Chapter 2 – S-Register Summary

S-Register Summary

Voice mode S-Register changes are outlined below.

S-Register	Description
S0	Automatic answer is disallowed in Voice mode.
S7	Wait for Carrier After Dial. Default is 60 seconds. In Voice mode, S7 contains the maximum amount of time that the modem will wait during Call Origination, all the time detecting for ringbacks, before assuming that the remote station will not go off hook.
S10	Automatic disconnect is disallowed in Voice mode.

Chapter 3 – Voice Commands

The MultiModem +V Voice enhancements are implemented with 33 AT+V (for Voice) commands.

In general, the modem does not accept Data mode (+FCLASS=0) commands or Fax mode (+FCLASS=1, 2, 2.0) commands when in Voice mode (+FCLASS=8). The set of existing commands that are changed for Voice mode support is outlined below.

Command	Description
A	Disallowed in Voice mode.
D	Causes the modem to Dial assuming +VLS=2 if +VLS=0 when the ATD command was entered.
H	Values greater than 0 disallowed in Voice mode.
I	Disallowed in Voice mode.
L	Disallowed in Voice mode.
M	Disallowed in Voice mode.
O	Disallowed in Voice mode.
Q	Disallowed in Voice mode.
X	Disallowed in Voice mode.
Z	Reset modem.
&D	&D1 is disallowed in Voice mode.

Voice +V Commands

The set of supported +V Voice commands added for Voice mode support is outlined below.

Command	Description
+VNH=	Automatic Hang-up Control
+FMI?	Report Manufacturer's ID
+FMM?	Report Product ID
+FMR?	Report Version Level
+FLO=	Select Flow Control Method
+VIP	Initialize Voice Parameters
+VRX	Enter Voice Receive State
+VTS	Produce DTMF and Tone Generation in Voice Mode
+VTS=?	Report Frequency Support
+VTX	Start Voice Transmission Process
+VXT=	Translate Voice Data
+VXT=?	Report Translation Support
+VGR=	Set the Gain for Received Voice Samples
+VGT=	Set the Volume for Transmitted Voice Samples
+VIT	Set DTE/DCE Inactivity Timer
+VLS=	Select Analog Source/Destination
+VLS=?	Identify Analog Source/Destination Configuration and Event Reporting Capabilities
+VRA=	Set Ringback Goes Away Timer
+VRN=	Set Ringback Never Appeared Timer
+VSD=	Set Silence Detection Sensitivity
+VSM=	Select Voice Compression Method
+VSM=?	Report Voice Compression Method
+VTD=	Select Default Beep Tone Duration Timer (DTMF/Tone Generation Duration)
+VDR=	Enable/Disable Distinctive Ring (Ring Cadence Reporting)
+VDT=	Control Tone Cadence Reporting
+VEM=	Event Reporting and Masking
+VEM=?	Report Event Reporting and Masking Capabilities
+VBT=	Set Modem Flow Control Assert and De-assert Points
+VBT=?	Report Modem Flow Control Assert and Deassert Points
+VPP=	Enable or Disable Voice Mode Packet Protocol
+VPR=	Select DTE/DCE Interface Rate (Turn Off Autobaud)

Command: **+VNH=<hook><Enter>**
Function: Automatic Hang-up Control
Values: 0, 1, 2, and 3-255
Default:
Result Codes: OK if command accepted; ERROR if parameter out of range.
Description: The +VNH command causes the modem to enable or disable automatic hang-
              ups to a varying degree when in Data mode or Fax mode, as shown below:
              +VNH=0   Enable automatic hang-ups as is normal in other non-Voice modes
                        (such as
                        hanging up the phone when the modem does not detect a data
                        carrier within a
                        given time interval).
              +VNH=1   Disable automatic hang-ups in other non-Voice modes
              +VNH=2   Disable automatic hang-ups in other non-Voice modes. The modem
                        performs
                        only a "logical" hang-up (i.e., returns the OK result code).
              +VNH=3-255 Reserved for future standards

Command: **+FMI?<Enter>**
Function: Report Manufacturer's ID
Values:
Default:
Result Codes: Only unsolicited result codes (not the standard AT -type OK result code)
Description: The + FMI? command causes the modem to report text consisting of a single line
              with the modem manufacturer's name (Multi-Tech), and our address, phone, and
              fax numbers.

Command: **+FMM?<Enter>**
Function: Report Product ID
Values:
Default:
Result Codes: Only unsolicited result codes (not the standard AT -type OK result code)
Description: The +FMM command causes the modem to report text consisting of a single line
              with the modem's name (e.g., MultiModem).

Command: **+FMR?<Enter>**
Function: Report Version Level
Values:
Default:
Result Codes: OK or ERROR
Description: The +FMR command causes the modem to report the firmware version number
              and/or a date code (e.g., Vs. 2.07 - 2/4/95).

Command: **+FLO=<method><Enter>**
Function: Select Flow Control Method
Values: 0, 1, 2, and 3-255
Default:
Result Codes: OK, or ERROR
Description: The +FLO? command lets you select the method of flow control provided and used by the modem. If +FLO=0, some other method (such as credit flow control) is used. The Xon-Xoff method is required. Xon is the ASCII character <DC1> (11 hex). Xoff is the ASCII character >DC3> (13 hex). CCITT V.24 circuits 106 and 133 are optional flow control methods. If circuits 106 and 133 are not used (+FLO<>2), then circuit 106 is held On whenever +FCLASS=8. In Voice mode, circuit 105 has no effect on the state of transmitted data. (Circuit 133 normally reverts to use as circuit 105 (RTS) when not used for Flow Control.)
+FLO=0   Disable Xon-Xoff and 133/105 flow control
+FLO=1   Enable Xon-Xoff flow control in either direction
+FLO=2   Enable CCITT Circuit 133 for flow control of the modem by the PC; use CCITT Circuit 106 for flow control of the PC by the modem.
+FLO=3-255   Reserved for future standards

Command: **+VIP**
Function: Initialize Voice Parameters
Values: 0 (optional)
Default:
Result Codes:
Description: The +VIP command causes the modem to initialize all Voice parameters to the factory default settings. This command has the same effect as if the PC had issued commands for the individual parameter settings. The +VIP command has no effect on the +FCLASS setting. The optional command +VIP=0 <Enter> provides a selection of default profiles.

Command: **+VRX**
Function: Enter Voice Receive State
Values: 0, 1, 2-127, and 128-255
Default:
Result Codes: Values (above) if the modem accepts the command; ERROR if the modem is not connected to an off-hook Telco line, or one non-Telco input device.
Description: The +VRX command causes the modem to start the voice reception process. The modem starts the process by returning the CONNECT result code to the PC. The modem then sends shielded voice data to the PC, in the format previously selected by the +VSM command.

The modem exits the voice receive state by one of two means: a <DLE><!>, and an Inactivity Timer timeout. During the voice receive, the modem informs the PC of pertinent events, such as Presumed End of Message (Quiet), and Presumed Hang-up (Silence) detected, Busy detected, and Dial Tone detected, so that at the discretion of the PC, the PC may terminate the voice receive state. On termination of the voice receive state, the modem returns the OK result code, and then returns to the Voice Command state.

The Inactivity Timer is in effect during the receive operation. If the PC uses this timer and stops the modem from performing unwanted restarts, the PC must assure that there is data sent from the PC to the modem often enough to refresh the timer. The +VRX commands are as follows.

+VRX=0   Voice receive operation. This selection does not provide for modem periodical tone production during a voice receive operation. The PC must issue the proper notifications of a record operation in progress by message playbacks to satisfy possible legal requirements.

+VRX=1   Voice receive operation. This selection does not provide for modem periodical tone production during a voice receive operation. The tone frequency and cadence is manufacturer specific.

+VRX=2-127   Reserved for future specification.

+VRX=128-255 Manufacturer specific.

The result code values (0, 1, 2-127, 128-255) are returned if the modem accepts the command. The ERROR result code is returned if the modem is not connected to an off-hook Telco line, or one non-Telco input device.

Command: **+VTS=<string>**
Function: Produce DTMF and Tone Generation in Voice Mode
Values:
Default:
Result Codes:
Description: The +VTS command causes the modem to produce DTMF tones, single-frequency tones, and optionally, double-frequency tones. This command allows the PC to generate a dial tone, busy, etc. for those modems capable of generating two arbitrary tones. The modem may perform tone detection during the playing of tones. When the modem receives the signal <DLE><!> to abort playing of the tones, the result code OK is displayed, and the modem returns to the voice command state.

The Inactivity Timer is in effect during the receive operation. If the PC uses this timer and stops the modem from performing unwanted restarts, the PC must assure that there is data sent from the PC to the modem often enough to refresh the timer.

Modem support for the second tone generation is optional. The modem produces compliant DTMF tones when processing DTMF tone production codes. The modem does not necessarily produce compliant DTMF tones when producing two tones, even if the frequencies are correct for a given DTMF tone. The tone generation string consists of elements in a list where each element is separated by commas. Each element can be one of the following options:

- a single ASCII character in the set of 0-9, #, *, and A-D

- a string enclosed in square brackets [   ]

- a string enclosed in curly braces {   }

The modem interprets item 1 as a DTMF digit with duration set by the +VTD command. The modem interprets item 2 as a general dual tone and duration selection. The modem interprets item 3 as a DTMF tone with a different duration than that given by the +VTD command.

Missing parameters are assumed to be the default value. Unspecified values always default to 0 for frequencies, DTMF * for DTMF tones, and +VTD for duration. The omissions of commas (and associated subparameters) are valid.

The quantity in the square brackets consists of a three-element list. The first element is the first frequency, the second element is the second frequency, and the third element is the duration, in 0.01-second intervals. A list may contain null elements. For example [3000] means that the modem generates a single tone at 3000 Hz for the default duration. [3000,3300] means that the modem generates a dual tone at 3000 and 3300 Hz for the default duration. [,3300] means that the modem generates a single tone at 3300 Hz for the default duration.

The quantity in the curly braces consists of a two-element list. The first element is the DTMF tone character, and the second element is the tone duration in 0.01 seconds. The DTMF tone characters are listed above. A list may contain null elements. For example, {@} means DTMF tone "2" for the default duration. {} means silence for the default duration.

The modem will stop the tone generation at the point in the string where the modem detects a parsing error, encounters an invalid frequency range, encounters a <CR>, or encounters a semi-colon.

The modem returns the OK result code if the PC accepts the command. The ERROR result code is displayed if the modem encountered an error in parsing the subparameter, or if the selected frequency is out of range.

Example: Using the +VTS command for tone generation without using any null elements:
AT=VTS=1,2,[1000,1300,50],{*6},{800,1300,50},9
The above string will perform as follows:
1. Play DTMF 1 with a duration given by the +VTD command.
2. Play DTMF 2 with a duration given by the +VTD command.
3. Play tone pair at 1000 Hz and 1300 Hz with a duration of 500 ms.
4. Play DTMF * with a duration of 60 ms.
5. Play tone pair at 800 Hz and 1300 Hz with a duration of 500 ms.
6. Play DTMF 9 with a duration given by the +VTD command.

Command: **+VTS=?**
Function: Report Frequency Support
Values: N/A
Default: N/A
Result Codes: OK follows the string
Description: The +VTS=? command reports the current frequency range in the form:
<freq1>,<freq2>,<dur> , where
<freq1> is the first frequency range,
<freq2> is the second frequency range, and
<dur> is the duration range for the square brackets and curly brace constructs.
The units are in 0.01 seconds. The range of valid <dur> values is that of the +VTD command.
Example: In the example below, the modem responds to the +VTS=? command by reporting that it supports two frequencies, both in the range of 200-3300 Hz, and supports a duration range from 0 to 5 seconds.

AT+VTS=?
(200-3300), (200-3300), (0-500)
OK

Command: **+VTX**
Function: Start Voice Transmission Process
Values:
Default:
Result Codes: OK on completion of transmission; CONNECT if the modem accepts the command; ERROR if the modem is not connected to at least one off-hook Telco line, or one non-Telco device.
Description: The +VTX command causes the modem to start the voice transmission process. The PC sends the data in the format of the previously entered +VSM command, using the flow control method selected by the +FLO command. The voice data is buffered to withstand gaps of missing data from the PC. If the modem does not have any current voice data, the modem sends silence over to the analog destination until the PC provides more voice data. The modem returns the OK result code and returns to Command mode after the modem has completely transmitted its buffer contents. The Inactivity Timer can be used to terminate the transmit data state, after which the modem returns to Command mode.

Command: +VXT=<conv>, <bps>
Function: Translate Voice Data
Values: <conv>=0, 1; <bps>=_____
Default: <conv>=0; <bps>=_____
Result Codes: CONNECT if the modem accepts the command. ERROR if either one or both of the following apply: 1) any subparameters are out of range, or 2) any subparameters are missing.
Description: The +VXT= command causes the modem to start a translation from or to a Multi-Tech proprietary voice data stream format to an unsigned linear PCM format (i.e., an "Interchange" format) with a length specified by the <length> parameter. This command allows distribution of pre-recorded prompts and sounds for use on all modems, and also allows interchange of sound files with other modems that use different compression schemes.

The operation is full duplex and not real-time. The modem uses flow control to stop a modem buffer overrun, and to recognize PC flow control to stop a PC buffer overrun. The modem and PC use shielded Xon-Xoff characters in the data stream. The modem does no interpolation or decimation to change the sample rate for this command. The PC selects the bits-per-sample setting, and silence compression setting using the +VSM command before using the +VXT translate command.

When the translation process goes from the proprietary format, the bits-per-second setting must match the setting used to create the voice data. When the translation process goes from the "interchange" format to the proprietary format, the PC may select any valid bits-per-sample setting for the selected proprietary compression method. The modem may report unsolicited result codes during the conversion process.

When the PC terminates the translation, the modem displays the OK result code and returns to Command mode after the modem has completely translated the contents of its buffer. The Inactivity Timer is in effect while the translate operation is in progress.

The parameter <conv> is the conversion direction. If <conv=1>, means the modem is to translate from an "interchange" value to a proprietary format selected by the +VSM command, to the "interchange" format. The value 0 is the only valid value; the values 2-255 are reserved for future standards.

The parameter <bps> is the bits-per-sample of the PCM coded data. The modem will pack the PCM data if applicable. The PC can request the native length using the +VXT=? command. The modem performs the necessary padding or truncation on the PCM outputs (from the modem) from the native length ("raw" sample) to the requested bits-per-sample.

Command: **+VXT=?**
Function: Report Translation Support
Values:
Default:
Result Codes:
Description: The +VXT=? command displays the current voice transmission parameters in the
                   format <bps>, <length>, where:
                   <bps> is the bits-per-sample that the modem can either pad or truncate a linear
                   PCM sample from its raw sample length to the PC's requested length, and
                   <length> is the bits-per-sample of the modem's raw voice sample.
Example: In the example below, the modem responds to the +VXT=? command by
                   reporting that it supports PCM code words in the native sample length and
                   padded out to 12 and 16 bits, and the modem native sample length is 8 bits.

                   AT+VXT=?
                   (8, 12, 16),(8)
                   OK

Command: **+VGR=<gain>**
Function: Set the Gain for Received Voice Samples
Values: 0-255
Default:
Result Codes: OK if the modem accepts the command; ERROR if the parameter is out of range.
Description: The +VGR= command causes the modem to set the gain for the received voice
                   samples. Receive gain values larger than 128 indicate a larger gain than
                   nominal, and values smaller than 128 indicate a gain smaller than nominal. The
                   modem may limit the receive gain to a narrower range, such as from 120 to 136,
                   or from 120 to 128. The value 0 is reserved for modem automatic gain control
                   (AGC).

Command: **+VGT=<level>**
Function: Set the Volume for Transmitted Voice Samples
Values:
Default:
Result Codes: OK if the modem accepts the command; ERROR if the parameter is out of
                   range.
Description: The +VGT= command causes the modem to set the volume control, either by
                   attenuating or amplifying the signal, for the transmitted voice samples. Values
                   larger than 128 indicate a larger gain than nominal, and values smaller than 128
                   indicate a gain smaller than nominal. The modem may limit the receive gain to a
                   narrower range. The value 0 is reserved for modem automatic volume control
                   (AVC).

Note: The modem will limit the transmit level over the Telco lines, regardless of the current
+VGT setting, to that permitted by CFR FCC Rules Part 68 - Subpart d.

Command: **+VIT=<timer>**

Function: Set DTE/DCE Inactivity Timer

Values:

Default:

Result Codes: OK if the modem accepts the command. ERROR if the parameter is out of range.

Description: The +VIT command sets the initial value for the PC/Modem Inactivity Timer. The permitted range is displayed by the +VIT=? command. The units are in 1.0 seconds. Disable the Inactivity Timer by using a value of 0 (+VIT=0).

The Inactivity Timer ensures the modem remains accessible to voice-unaware software. The Inactivity Timer is activated when the PC selects the voice fixed-rate. The timer expires if the flow of data from the PC to the modem stops (in both Voice Command mode and Data mode) for a specified amount of time.

When this timer expires, the modem switches to Data mode with autobauding. Voice-unaware software recovers control of the modem in the event of catastrophic failure not resulting in modem power down. It is recommended that the PC software leave the modem in autobauding (and Data mode), and use the Inactivity Timer only as needed. Leaving the modem in autobauding is an extra measure to prevent confusion from voice-unaware software accessing the modem in Voice mode at a fixed PC/modem interface rate. Use the H command to switch to autobauding and Data mode automatically. In Voice mode, the modem does not allow the autoanswer feature, since this feature does not allow the PC to set the modem in Voice mode before answering the phone.

Command: **+VLS=<label>**

Function: Select Analog Source/Destination

Values:

Default:

Result Codes: OK if command accepted. ERROR if the <label> parameter is out of range or if the modem cannot service the <label> parameter requested.

Description: The +VLS= command selects one or more source and destination devices for the analog data to be transmitted. The parameter <label> is used to identify each of the supported analog source/destination hardware devices. Codes, called "primitives", are provided to describe which voice I/O device(s) are components in a possible hardware configuration. The codes are grouped to help define and label common hardware configurations.

Code	Description
L	Local phone (no number code)
T	Telco line (no number code)
M	Internal microphone
M1	External microphone
S	Internal speaker (requires squelch on any microphone activity)
S1	External speaker (requires squelch on any microphone activity)
H0	External microphone and speaker combination (handset or headset)

The lists that follow contain 16 commonly used hardware configurations with the label and codes used to select each configuration.

Agere-Based Product

\<label\>	Code	Description
0	none	Modem on-hook. Local phone connected to Telco.
1	T	Modem off-hook, and connected to Telco. Local phone provided with power to detect hook condition.
2	L	Modem off-hook. Local phone connected to modem.
3	LT	Modem off-hook. Local phone connected to Telco. Modem connected to Telco.
4	S	Internal speaker connected to the modem. Modem is on-hook. Local phone connected to Telco.
5	ST	Internal speaker connected to Telco. Modem is off-hook. Modem is connected to Telco. Local phone provided with power to detect hook condition.
6	M	Internal microphone connected to modem. Modem is on-hook. Local phone connected to Telco.
7	MST	Internal microphone and internal speaker connected to Telco. Squelching active. Modem is off-hook, and connected to Telco. Local phone provided with power to detect hook condition.

Conexant-Based Product

+VLS Command Options

Label	Code	Description
0	None	DCE on-hook. Local phone connected to the line.
1	T	DCE off-hook. DCE connected to the line. Local phone provided with power to detect hook condition.
4	S	Internal Speaker connected to the DCE. DCE on-hook. Local phone connected to the line.
5	ST	Internal Speaker connected to the line. DCE off-hook. DCE connected to the line. Local phone provided with power to detect hook condition.
6	M	Internal Microphone connected to the DCE. DCE on-hook. Local phone connected to the line.
8	S1	External Speaker connected to the DCE. DCE on-hook. Local phone connected to the line.
9	S1T	External Speaker connected to the line. DCE off-hook. DCE connected to the line. Local phone provided with power to detect hook condition.
11	M1	External Microphone connected to the DCE. DCE on-hook. Local phone connected to the line.
13	M1S1T	External Microphone and External Speaker connected to the line. DCE off-hook. DCE connected to the line. Local phone provided with power to detect hook condition.

Command: +VLS=?

Function: Identify Analog Source/Destination Configuration and Event Reporting
               Capabilities
Values:
Default:
Result Codes: <label>,<devices>,<transmit event>,<receive event>,<idle event>
Description: The +VLS=? command displays the modem's current source and destination
               device information for the analog data to be transmitted. Refer to the +VLS=
               <label> command for label code and description information. Note that the +VEM
               command contains more information about event reporting.
Example: In the example below, the modem supports only a Telco line at Service Level C.

               AT+VLS=?
               0,"",0A0001000,0E601800,1A803840
               1, "T", 0A0001000,0E601800,1A803840
               OK

Command: +VRA=<interval>
Function: Set Ringback Goes Away Timer
Values: 0-50 (in 0.10-second increments)
Default: 50
Result Codes: OK if the modem accepts the command; ERROR if the <interval> parameter
               entered is out of range.
Description: The +VRA= command sets the amount of time the modem will wait between
               Ringbacks before the modem can assume that the remote device has gone off-
               hook. This command does not effect the Quiet Answer @ dial modifier; the
               +VRA command functions the same as the @ entered at the end of a dial string.
               Entering +VRA=0 forces the modem to return the OK result code immediately
               after the first Ringback. The parameter <interval> refers to the silence interval
               length between the end of one ring interval and the start of the next ring interval.

Command: +VRN=<interval>
Function: Set Ringback Never Appeared Timer
Values: 0-10 (in 0.1-second increments)
Default: 10
Result Codes: OK if the modem accepts the command; ERROR if the <interval> parameter
               entered is out of range.
Description: The +VRN= command sets the amount of time that the modem will wait for
               Ringback. If the modem does not detect a Ringback within the time period
               <interval>, the modem assumes that the remote device has gone off hook, and
               returns the OK result code. The modem only uses this command in call
               origination transactions. A +VRN= setting greater than the S-Register S7 setting
               means that only the S7 timer is in effect. Entering +VRA=0 forces the modem to
               return the OK result code immediately after dialing

Command: **+VSD=<sds>,<sdi>**
Function: Set Silence Detection Sensitivity
Values: 0-256 (in 0.1-second intervals)

Default:

Result Codes: OK if the modem accepts the command. ERROR if one or more of the following
                apply: 1) the <sds> or <sdi> parameter entered is out of range, or 2) either of the
                two parameters are missing from the command string. If an error occurs, the
                modem retains the previous <sds> and <sdi> parameter values.
Description: The +VSD= command sets the silence detection sensitivity and the required
                period of silence before the modem reports silence detected at the end of a voice
                receive, either with the Presumed End of Message (Quiet) or Presumed Hang-up
                (Silence) event reports. The table below outlines the possible combinations of the
                +VSD and +VSM commands using the <sds> parameter. An <sdi> parameter
                value of 0 means that long-term silence detection is disabled. (Note that long-
                term silence detection refers to the use of this function to detect the end of a
                voice receive (i.e., the user stops talking).

+VSD <sds>	+VSM Silence Compression In Use	+VSM Silence Compression Not Used
0	Use +VSM silence compression setting and algorithm for long-term silence detection.	Use default long-term silence detection level and algorithm.
not 0	Sets long-term silence detection setting independent of presence or use of silence detection, where: <sds> = 128; nominal level of silence detection sensitivity <sds> > 128; more aggressive level of silence detection sensitivity (less sensitive, higher noise levels considered to be silence). <sds> < 128; less aggressive level of silence detection sensitivity (more sensitive, lower noise levels considered to be silence).	

The parameter <sds> is used by the PC to select greater amounts of modem silence detection
            activity; larger values imply that the PC wants the modem to treat noisier
            conditions as silence. The value entered for <sds> has no actual unit of measure.
            The modem may limit silence detection sensitivity to a more narrow range (e.g.,
            from 120 to 136). A setting of 0 has no meaning.
            The parameter <sdi> sets the required period of silence before the modem can
            report silence detected either with the Presumed End of Message (Quiet) or
            Presumed Hang-up (Silence) event reports. A value of 0 disables modem silence
            detection, in which case the modem will not report the Presumed End of
            Message (Quiet) or Presumed Hang-up (Silence) event reports.

Command: **+VSM=\<cml\>,\<vsr\>,\<scs\>,\<sel\>**
Function: Select Voice Compression Method
Values: (see individual parameter descriptions)
Default: (see individual parameter descriptions)
Result Codes: OK if the modem accepts the command. ERROR if one or more of the following applies: 1) the any parameter entered is out of range, or 2) any of the four parameters are missing from the command string. If an error occurs, the modem retains the previous \<sds\> and \<sdi\> parameter values.
Description: The +VSM= command sets the modem to a specified voice compression method, silence compression sensitivity, and voice sampling rate. The modem can maintain a different event detection capability for each compression method. This command allows the PC to set the amount of silence compression appropriate to a particular situation or application. For example, you may want to record your welcome message with the lowest amount of silence removal, with the goal of reducing distortion, meanwhile recording other messages with a more assertive silence removal, to limit disk space used for recording purposes.

          \<cml\>   is used by the PC to select a compression method. The valid range of values is from 128-256. The range of values from 0-127 is reserved for future standards.

          \<vsr\>   is used to select the modem voice-sampling rate from the set of those supported. The unit of measure is samples per second. See the +VSM=? command for the list of sampling rates supported by the modem.

          \<scs\>   has different meanings in voice transmit and voice receive modes. In voice receive, the PC uses \<scs\> to select greater amounts of compression activity; larger \<scs\> values mean that the PC wants the modem to treat noisier conditions as silence. There is no unit of measure for this parameter; it merely represents a number in a range. A value of 0 disables modem silence compression.
                        In voice transmit mode, the PC signals the modem that the data stream was recorded with silence compression by selecting a non-zero value from within the valid range (the same value as receive). Unpredictable results can occur if you 1) enable silence compression for transmitting a voice data stream that was not recorded with silence compression enabled, or 2) you disable silence compression for transmitting a voice data stream that was recorded with silence compression enabled. You can modify the silence expansion with the \<sel\> parameter. The range of valid values is 0-255. The modem may limit silence compression sensitivity to a narrower range (e.g., 120-128). A setting of \<scs\>=0 disables silence compression.

          \<sel\>   is used to modify the amount of silence expansion. This parameter represents the minimum amount of silence that the modem will expand a period of silence that was previously deleted with a non-zero \<sel\> parameter. A setting of \<sel\>=0 means the modem will not modify the silence expansion. The valid range of values is ____ - ____ in 0.1-second increments. The modem ignores the \<sel\> parameter if the \<scs\> parameter is 0 (silence compression disabled).

Command: +VSM=?
Function: Report Voice Compression Method
Values:
Default:
Result Codes: OK
Description: The +VSM=? command reports several compression method identifiers either, 1) a compression method (for PCM coding) from the table below, or 2) a co-operative identifier (non-PCM coding) used with other manufacturer's equipment.
Example: The following shows the modem reports that it supports two compression methods.

      AT+VSM=?
      128,"SIGNED PCM",12,0,(7200-8000,11025),(127-129),(0-50)
      132,"ADPCM/AQ",2,40,(7200),(128),(0-50)

      The compression method identifiers display the compression method in the form <cmid>. Non-PCM coding reports the compression method identifiers in the form <cmid>/<author>, where <cmid> is the compression method and <author> is the method source. The source <author> may be a proprietary method or it may reference a published standard. Each field is limited to 20 characters. The +VXT command is used to start a translation to or from a particular manufacturer's proprietary voice datastream format to an unsigned (non-PCM) format.

Identifier	Description
Signed PCM	Linear PCM sampling using twos complement signed numbers
Unsigned PCM	Linear PCM sampling using unsigned numbers
A-Log/Author	Compression using a-law
U-Log/Author	Compression using u-law
DPCM/Author	Differential Pulse Coded Modulation
DPCMAQ/Author	Differential Pulse Coded Modulation with Adaptive Quantizier
ADPCM/Author	Adaptive Differential Pulse Coded Modulation
VSELP/Author	Vector Sum Exited Linear Predictor
RELP/Author	Residual Exited Linear Predictor
CELP/Author	Codebook Exited Linear Predictor
CVSD/Author	Continuously Variable Slope Delta Modulation
TDHS/Author	Time Domain Harmonic Distortion
ADM/Author	Adaptive Delta Modulation
DM/Author	Delta Modulation
APC/Author	Adaptive Predictive Coding
ATC/Author	Adaptive Transform Coding
SBC/Author	Sub-Band Coding
GSM/Author	Regular Pulse Excitation Long-term Predictor (RPELTP)
LPC/Author	Linear Predictive Coding
EAPDPCM/Author	Embedded Bit ADPCM
MP-LPC/Author	Multipulse LPC
LSLTCQ	Least Squares Lattice Trellis Coded Quantization

   Note: IS-101 does not make any provisions for standard compression modifiers.

Command: **+VTD=<dur>**

Function: Select Default Beep Tone Duration Timer (DTMF/Tone Generation Duration)

Values:

Default:

Result Codes: OK if the modem accepts the command. ERROR if the parameter is out of range.

Description: The +VTD= command causes the modem to set the default DTMF/tone generation duration used with the +VTS command. This command does not affect the ATD command settings. The <dur> parameter range is given by the +VTD=? command, in units of 0.01 seconds. A setting of +VTD=0 specifies a manufacturer-specific time interval.

Command: **+VDR=<enable>,<report>**

Function: Enable/Disable Distinctive Ring (Ring Cadence Reporting)

Values: see "Description"

Default:

Result Codes: OK if the modem accepts the command. ERROR if the parameter is out of range.

Description: The +VDR command causes the modem to enable or disable reporting of the ring cadence information, and to control the timing of the Ring event code report if ring cadence reporting is enabled.

This report format is one line per silence period, and one line per ring period. The length of the silence period is in the form DROF=<number in units of 0.1 seconds><CR><LF>, and the length of the ring in the form DRON=<number in units of 0.1 seconds>. The <LR> character is optional. The modem may produce a Ring event code after the DRON message if enabled by the <report> parameter. The <report> parameter should be set to a value larger than the expected off-times within a single pattern so that the Ring event reports are issued only during the off-times between the complex patterns.

<enable>	<report>	Description
0	N/A	The modem will not generate ring cadence reports. Other call progress event codes (including Ring) are reported as normal.
1	0	The modem only produces DROF and DRON messages. Other call progress result codes (including RING) are reported as normal.
1	non-zero	The modem only produces DROF and DRON message. The RING result code is displayed after the falling edge of the ring pulse (i.e., after the DRON report).
2-255	non-zero	Reserved for future standards.

Example: The example below shows a cadence with an off time of 4.0 seconds, an on time of 0.8 seconds, an off time of 0.4 seconds, and an on time of 0.8 seconds. The RING result code is displayed 0.5 seconds after the last DRON message. The command to enable this sample sequence is +VDR-1,5 , as shown below:

```
><X>
RING
DROF=40                    <DLE><.>
DRON=8                     <DLE><X>
DROF=4                     DROF=40
DRON=8                     DRON=8
                           DROF=4
                           DRON=8
                           RING
                           <DLE><.>
```
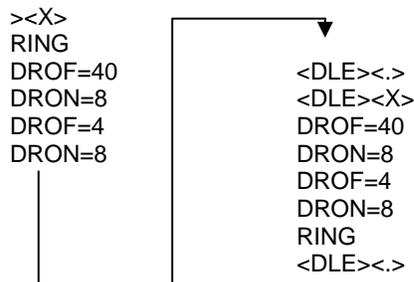
Command: **+VDT=<enable>,<report>**
Function: Control Tone Cadence Reporting
Values:
Default:
Result Codes: OK if the modem accepts the command; ERROR if the parameter is out of range.
Description: The +VDT command causes the modem to enable or disable reporting of the
                control tone cadence information in the frequency band used by the
                Ringback/Remote Ring, Busy, and Reorder/Fast Busy tones (usually in the 300 -
                600 Hz range). This reporting is subject to the tone detection restrictions reported
                by the +VLS=? command. The report format is one line per silence period, and
                one line per ring period. The length of the silence period is in the form
                CPOF=<number in units of 0.1 seconds><CR><LF>, and the length of the ring
                period is in the form CPON=<number in units of 0.1 seconds>. The <LR>
                character is optional.

Note: The +VEM command can disable the reporting of this command regardless of the current
              setting of the +VDT= command.

<enable>	<report>	Description
0	N/A	The modem will not generate control tone cadence reports. Control tone event codes are reported as normal.
1	0	The modem only produces DROF and DRON messages. The modem will not report any Ringback/Remote Ring, Busy, and Reorder/Fast Busy tones event codes. Other control tone event codes are reported as normal.
1	non-zero	(for future implementation)
2-255	non-zero	Reserved for future standards.

Example: The example below shows control tone cadence reporting enabled, with an on
                tone of 2.0 seconds and an off time of 4.0 seconds. The command used to
                enable the sample sequence is +VDT=1. Note the absence of the
                Ringback/Remote Ring, Busy, and Reorder/Fast Tone event reports.

Command: **+VEM=<mask>**

Function: Event Reporting and Masking
Values: bits 0 - 32 on (i.e., FFFFFFFF8)
Default:
Result Codes: OK if the modem accepts this command; ERROR if the bit field contains illegal characters.
Description: The +VEM= command can be used to disable an event report, regardless of the modem's state, or of the modem's analog signal source or destination's configuration. The <mask> parameter is a bit field where bit 0 is the most significant bit of an eight-digit hex number. The PC setting of a bit enable event reporting for that event. Bit 0 in the bit field corresponds to Event number 0 (Caller ID) (see Voice Mode Result Codes table for the bit field). This mask effects the reporting of the specified event in all modes (Fax, On-line data, AT Command and Voice modes). Events cannot be masked by modes; however, the PC can change the mask each time it changes modes. The modem-detectable events depend on the compression method selected by the +VSM command. The +VEM command may effect the reporting capabilities of other +V commands. The detection of an event may not be possible at all times and for all compression methods. Use the +VLS=? command to ask which times and for which compression methods (as well as for which analog source/destination selections) events can be detected and reported when not disabled by the +VEM command.
Example: In the example below, only the RING and the DTMF event detection reporting:

                AT+VEM+18000000
                OK

Command: **+VEM=?**

Function: Report Event Reporting and Masking Capabilities
Values: N/A
Default: N/A
Result Codes:
Description: The +VEM=? command returns four lines of modem event reporting/masking capability information, followed by the OK result code. The first line indicates the Service Level supported by the modem (though the modem may support more than the capabilities displayed). The next three lines report the capability of the Voice Transmit mode, Voice Receive mode, and the Voice Command mode, respectively. Each line is a hex value that is the bitwise OR function across all of the supported compression methods and across all analog source/destination hardware configurations (i.e., all +VLS settings) for the specified mode. Note that the displayed hex values are not connected to the <mask> parameter in the +VEM and +VEM? commands.

Interface Configuration Commands

The commands in this section are used to define the interface between the PC and the modem.

Command: **+VBT=<deassert>,<assert>**
Function: Set Modem Flow Control Assert and Deassert Points
Values: <assert> and <deassert> are buffer offsets from the start of the buffer. The buffer's first position is 0. The offset units are octets.
Default:
Result Codes: OK if the modem accepts the command; ERROR if either the <assert> or <deassert> parameter is greater than the buffer size, or if the <deassert> parameter is greater than or equal to the <assert> value.
Description: The +VBT= command is used to set the flow control assert and deassert points inside the modem's internal transmit buffer. As data is sent from the PC to the modem and is stored in the modem's buffer, when the number of octets in the buffer equals the <assert> value, the modem asserts flow control to the PC (e.g., turns off CTS circuits, or sends an Xoff character). As the modem removes data from the buffer and processes the data, when the number of octets in the buffer equals the <deassert> value, the modem deasserts flow control (e.g., turns on CTS circuits, or sends an XOn character). The modem may inform the PC (using the +VBT=? command) that the PC does not permit the modifying of the flow control assert and deassert points by returning a single value, not in the range of values, for each control point.
The +VBT= command controls the amount of "skid" in the modem's voice buffer, where "skid" is the amount of octets that the modem could accept before losing data after the modem asserts an off flow control signal to the PC.
You can use the +VBT= command to balance performance versus robustness. For example, if the PC knows there are only 16450 UARTs present, a small "skid" is probably sufficient. If there are 16550 UARTs present, a larger "skid" is probably required.

Command: **+VBT=?**
Function: Report Modem Flow Control Assert and Deassert Points
Values:
Default:
Result Codes:
Description: The +VBT=? command displays the possible <assert> and <deassert> values set by the +VBT= command, followed by the OK result code.
Example: In the example below, the +VBT=? command is used to ask about the modem's flow control and buffer size ranges. The modem reports that the deassert point is adjustable between 20 and 100 octets, the assert point is adjustable between 150 and 180 octets, and the transmit buffer size is 200 octets.

AT+ABT=?
(20-100) , (150-180) , (200
OK

Command: **+VPP=<enable>**

Function: Enable or Disable Voice Mode Packet Protocol

Values: 0, 1; (2-255 reserved for future standards)

Default:

Result Codes: OK if the modem accepts the command; ERROR if the <enable> value is out of range.

Description: The +VPP= command enables and disables the Packet protocol for Voice mode operation, and handles the new unsolicited Voice mode result codes. The Packet protocol is used to detect lost octets on the modem-to-PC serial link, and to recover the lost octets by requesting retransmission. The Packet protocol assumes 1) that the data corruption is not a problem on the communications link, and 2) that the last octet sent will never be lost due to data overrun (i.e., that the newer octets always overwrite previous octets in the communications input buffer, a common UART design feature). Several PC processes can cause serial input channel neglect for longer than the Protocol time between asynchronous characters (typically less than 521 microseconds), and data loss can occur. If a character is lost in the received data, the playback of the voice data may be impaired or lost. If a character is lost in the final result code, the connection may fail. The Packet protocol permits recovery from such data loss.

Command: **+VPR=<rate>**

Function: Select DTE/DCE Interface Rate (Turn Off Autobaud)

Values: 0, 1, 2, 3, 4, 5, 6, 7, and 8

Default:

Result Codes: OK if the modem accepts the command. ERROR if the <rate> value is out of range.

Description: The +VPR= command causes the modem to select between various fixed modem-to-PC interface rates and autobauding. The selected fixed interface rate stays in effect until the modem selects another interface rate or autobauding, or until the modem returns to autobauding on the expiration of the Inactivity Timer. The newly selected rate takes effect after the modem returns the OK result code.

++VPR=0	select autobauding
+VPR=1	select 2400 bps
+VPR=2	select 4800 bps
+VPR=3	select 7200 bps
+VPR=4	select 9600 bps
+VPR=5	select 12000 bps
+VPR=6	select 14400 bps
+VPR=7	select 16800 bps
+VPR=8	select 19200 bps

If the modem claims support for autobauding (+VPR=0), it means that the modem can accept AT commands at 2400 bps at all times while in Voice command mode and with +VPR=0.

Flow Control

XON/XOFF flow control is used by the MultiModem to match the PC-to-modem data rate to the line signaling rate, as well as to the requirements of analog conversion of the voice signals and voice data.

In-band, uni-directional XON/XOFF flow control is mandatory. RTS/CTS (V.24 circuits 106 and 133) flow control is optional per the IS-101 standard.

Voice Mode Result Codes

In Voice mode, the modem detects and reports DTMF, detects call progress tone and cadence events, evaluates voice quality, and monitors Telco-related activities. Events are reported as a single character (Simple or "Terse"), a full-text message (Message or "Verbose"), or as a repeating pattern (Pattern).

Voice Mode Result Codes

Terse	Verbose
0	Caller ID Report
1	DID Report
2	Distinctive Ringing
3	RING
4	DTMF Received
5	Receive Buffer Overrun
6	Facsimile Calling (e.g., 1100 Hz)
7	Data Calling (e.g., 1300 Hz)
8	Local Phone On/Off Hook
9	Presumed Hang-up (SILENCE) Time-out
10	Presumed End of Message (QUIET) Time-out
11	SIT Tone (CO Standard Information Tones, sent to pay phones)
12	Bong Tone (Calling Card Tone)
13	Loop Current Interruption
14	Loop Current Polarity Reversal
15*	Call Waiting Beep/Interrupt*
16*	Distinctive Call Waiting*
17*	TDD Detected (e.g., 1400/1800 Hz)*
18	Ringback/Remote Ring
19	BUSY
20	DIALTONE
21	Reorder/Fast Busy
22	V.21 Channel 2 7E Flags
23	Transmit Buffer Underrun
24	Extension Phone On/Off Hook
25	Facsimile or Data Answer (e.g., 2100 Hz)
26	Data Answer (e.g., 2225 Hz)
27	Voice Detect
28	Call Waiting Plus Caller ID
29	Stuttered Dialtone
30	Invalid Voice Data Format
31	Lost Data Detected Event
32	Facsimile Answer
33-63	Reserved for future standard
above 63	Manufacturer specific

Note: Further study required for final specification. The TIA/EIA-602 CONNECT result code is disallowed in voice mode.

Unsolicited Voice Mode Result Codes

The unsolicited result codes for voice mode differs from standard modem Command mode result codes. The +V specification refers to these voice mode result codes as "event detection reports". Event detection reports are provided in simple report format when one character is enough to report an event, such as RING. A complex report format is used when one character is not enough to report an event; generally, all multi-character responses.

Complex event reports are in the format <tag> <=> <data> <cr>, where <tag> is the data type, = is the ASCII = sign, <data> is a specific data instance, and <cr> is ASCII 13 decimal. The table below defines the complex event report tags.

Valid Complex Event Report Tags

Tag	Description
TIME	Caller ID Tag in the form TIME=HHMM, where HH is the hour (00-23) and MM is the minute (00-59). All numbers are in ASCII and numbers less than 10 have a leading 0.
DATE	The current date in the format MMDD (where MM is the month 0-12 nad DD is the day 01-31). All numbers are in ASCII and numbers less than 10 have a leading 0.
NMBR	The caller's telephone number, in the format NMBR=<Number> or P or O (ASCII 4F hex). The P indicates the caller's information is unavailable (Private).The O indicates the caller's information is unavailable (Outside area code).
NAME	The caller's name in the format NAME=<Listing Name>.
MESG	Indicates a data item not listed above in Multiple Message Format: MESG=<Data Tag><Length of Message><Data><Checksum> in printable ASCII (to avoid confusion with binary output).
ERRM	Error Tag (used for Caller ID and other uses). Refer to the +VCID command.
DRON	Distinctive Ring Cadence On time.
DROF	Distinctive Ring Cadence Off time.
CPON	Control Tone Cadence On time.
CPOF	Control Tone Cadence Off time.
CWON	Call Waiting Cadence On time.
CWOF	Call Waiting Cadence Off time.
ASTB	See Voice Mode Shielded Codes table.
NDID	DID Services. Refer to the +VDID command.
SITT	The data value for the SITT tag, in the format <SITT><=><data><cr>, where <data> means:

	ICNT	Intercept Tone
	VCCT	Vacant Code Tone
	REOT	Reorder Tone
	NCDT	No Circuit Detected Tone
	TON4	Fourth SIT Tone Number
	TON5	Fifth SIT Tone Number
	TON6	Sixth SIT Tone Number
	TON7	Seventh SIT Tone Number

In the event of an unrecognized data tag, the MultiModem presents the data item information as printable hex ASCII numbers following the MESG tag. For example:

> RING
>
> DATE=0321
> TIME=1405
> NMBR=5045551234
> NAME=DOE JOE
> MESG=060342424231
>
> RING
>
> RING

Unformatted Form Reporting

The MultiModem does not display the Caller ID information if it detects a checksum error in the caller ID packet (either SDM or MDM) while in presentation mode. If the MultiModem receives multiple copies of the Caller ID packets, the MultiModem presents all of the packets to the computer. The MultiModem presents all data items and packet control information found in the SDM and MDM packets, except the leading Us (line seizure information) from the presentation. The checksum is included in the presentation. The entire Caller ID packet is presented in ASCII hex as printable numbers. The characters in the ASCII hex message are in the bit order presented to the MultiModem. The MultiModem does not insert spaces, <cr>, or <lf> ASCII codes for formatting between the characters of the packet.

The MultiModem does not check the checksum, and it is the computer's job to check message validity. Note that this means that the MultiModem presents the Caller ID information even if the MultiModem detects a checksum error in the Caller ID packet (SDM or MDM) in the presentation mode.

The MultiModem presents all of the information in the packet in ASCII hex as printable characters. The MultiModem includes all Message Type Octets, Message Length Octets, Data Octets, and Checksum Octets for the presentation mode.

Voice Mode Shielded Codes

These codes can be sent in either Command mode or Data mode. The DCE may return the event detection reports after the OK result code from the +FCLASS command. One or more simple event detection reports may be embedded within the data portion of a complex event detection report. The table below describes voice mode shielded codes. The number in the first column is the ASCII equivalent (in hex). The number in the second column refers to the numbering scheme used below.

Voice Mode Shielded Codes

Shielded Code	Hex	Event Report Description
<DLE>	(10)	Two contiguous <DLE><DLE> codes indicate a single <DLE> in the data stream.
<SUB>	(1A)	<DLE><DLE> in the data stream.
<ETX>	(3)	End Data State; signifies the end of voice data. Can end with Event 9 (Presumed Hang-up Timeout), Event 10 (Presumed End of Message), Event 13 (Loop Current Interruption), Event 14 (Loop Current Polarity Reversal), Event 19 (BUSY), or Event 20 (DIALTONE).
Q	(51)	Data stream shielded Xon character. Used in the +VXT command to shield XON characters in the full-duplex data stream and in the Packet Protocol.
S	(53)	Data stream shielded Xoff character. Used in the +VXT command to shield XOFF characters in the full-duplex data stream and in the Packet Protocol.
M	(4D)	Data stream shielded SOH code used for the Packet Protocol.
W	(57)	Data stream shielded ETB code used for the Packet Protocol.
F	(46)	Data stream shielded ACK code used for the Packet Protocol.
U	(55)	Data stream shielded NAK code used for the Packet Protocol.
G	(47)	Data stream shielded ENQ code used for the Packet Protocol.
T	(54)	Timing Mark.
X	(58)	Packet Header for the "Complex Event Detection Report" (additional event data transfers to the DTE).
.	(2E)	Packet Terminator for the "Complex Event Detection Report" (additional event data transfers to the DTE).
/	(2F)	Start of DTMF tone shielding.
~	(7F)	DTMF transitions to off.
R	(52)	Event Number 3 (RING). The <DLE> shielded version of the RING result code.
1	(31)	Event Number 4 (DTMF 1).
2	(32)	Event Number 4 (DTMF 2).
3	(33)	Event Number 4 (DTMF 3).
4	(34)	Event Number 4 (DTMF 4).
5	(35)	Event Number 4 (DTMF 5).
6	(36)	Event Number 4 (DTMF 6).
7	(37)	Event Number 4 (DTMF 7).
8	(38)	Event Number 4 (DTMF 8).
9	(39)	Event Number 4 (DTMF 9).
0	(30)	Event Number 4 (DTMF 0).

Shielded Code	**Hex**	**Event Report Description**
A	(41)	Event Number 4 (Extended Keypad DTMF A).
B	(42)	Event Number 4 (Extended Keypad DTMF B).
C	(43)	Event Number 4 (Extended Keypad DTMF C).
D	(44)	Event Number 4 (Extended Keypad DTMF D).
*	(2A)	Event Number 4 (Extended Keypad DTMF E).
#	(23)	Event Number 4 (Extended Keypad DTMF E).
o	(6F)	Event Number 5 (Receive Buffer Overrun).
c	(63)	Event Number 6 (Facsimile Calling).
e	(65)	Event Number 7 (Data Calling).
h	(68)	Event Number 8 (line current break). Local phone goes on hook.
H	(48)	Event Number 8 (line current detected). Local phone goes off hook.
s	(73)	Event Number 9 (Presumed Hang-up "SILENCE" Timeout).
q	(71)	Event Number 10 (Presumed End of Message "QUIET" Timeout).
J	(4A)	Event Number 11 (SIT Tone).
$	(24)	Event Number 12 (Bong Tone).
l	(6C)	Event Number 13 (Loop Current Interruption). Usually indicates a remote hang-up.
L	(4C)	Event Number 14 (Loop Current Polarity Reversal). May indicate a hang-up or a receive, depending on CO implementation.
w	(77)	Event Number 15 (Call Waiting/Beep Interrupt).
t	(74)	Event Number 17 (TDD Detected - 1400/1800).
r	(72)	Event Number 18 (Ringback).
b	(62)	Event Number 19 (BUSY). May be repeatedly sent.
d	(64)	Event Number 20 (DIALTONE). May be repeatedly sent.
K	(4B)	Event Number 21 (Reorder/Fast Busy).
F	(46)	Event Number 22 (V.21 Channel 2 7E flags).
u	(75)	Event Number 23 (Transmit Buffer Underrun).
p	(70)	Event Number 24 (Line voltage increase - extension phone goes on hook).
P	(50)	Event Number 24 (Line voltage increase - extension phone goes off hook).
a	(61)	Event Number 25 (Facsimile or Data Answer.
f	(66)	Event Number 26 (Data Answer).
V	(56)	Event Number 27 (Voice Detection). A high confidence of voice.
v	(76)	Event Number 27 (Voice Detection). A low confidence of voice.
i	(69)	Event Number 29 (Stuttered Dialtone).
E	(45)	Event Number 30 (Invalid Voice Data Format. Voice data is incompatible with selected Voice Compression Methods.
Y	(59)	Event Number 31 (Lost Data Detected Event).
m	(6d)	Event Number 32 (Facsimile Answer).
%	(25)	Event Number 63 (manufacturer specific).
&	(26)	Event Number 48 (manufacturer specific).
'	(27)	Event Number 49 (manufacturer specific).
(	(28)	Event Number 50 (manufacturer specific).
)	(29)	Event Number 51 (manufacturer specific).
all other 7-bit	ASCII	Reserved for future use.

Sample Session

This section provides Voice mode send and receive handshaking examples.

Suggested Compression Method and Sample Rate Selection

Command	Response
AT+VSM=?	The PC inquires about the compression methods and bits-per-sample options. The modem reports three compression methods:

• PCM, twelve bits per sample, timing marks, sampling rates of 7200-8000 and 11025, three levels of silence compression sensitivity, and silence clip to 0.5 seconds.

• The same as 1 above, but without silence compression.

• ADPCM, two bits per sample, timing marks, sampling rate of 7200, no silence compression, and no silence clip.

> 128, "SIGNED PCM", 12, 40, (7200-8000, 11025), (127-129), (0-50)
> 129, "SIGNED PCM", 12, 0, (7200-8000, 11025), (0), (0)
> 132, "ADPCM/AQ", 2, 40, (7200), (0), (0)
> OK

Command	Response
AT+VSM=128	The PC selects the first compression method with the intent of queuing the event detection capabilities of the modem.
OK	The modem agrees.
AT+VEM=?	Checks the modem event detection capability for the first compression method.
"C"	The modem reports Service Level C.
0A000100	
0E601800	
1A803840	
OK	
AT+VSM=132	Selects the second compression method with the intent of querying the event detection capabilities of the modem.
OK	The modem agrees.
AT+VEM=?	Checks the modem event detection capability for the second compression method.
"B"	The modem reports Service Level B.
0A000100	
04600000	
1A803040	
OK	
AT+VLS?	The modem inquires about what analog source and destinations are available. The modem reports that a microphone and speaker are available:

> 0, " ", 0A000100, 0E601800, 1A803840
> 1, " T", 0A000100, 0E601800, 1A803840
> 4, " S", 0A000100, 0E601800, 1A803840
> 6, " M", 0A000100, 0E601800, 1A803840
> OK

Command	Response
AT+VSD=?	The modem inquires about what end-of-voice receive silence detection capabilities are available.
127-129), (50-200)	The modem reports three levels of sensitivity and a time interval between 5.0 and 20.0 seconds.

Later, to transmit or receive a voice message, the PC selects:
- The first compression method at 7200 sampling rate, enable silence compression with nominal silence sensitivity, and no silence clipping.
- Report all modem-supported event detection
- Set end of receive silence detection at nominal silence sensitivity setting and for 5.0 seconds:
  AT+VSM=128, 7200, 128, 0; +VEM=FFFFFFFF8; +VSD=128, 50

OK   The modem agrees.

AT+VSM=129, 7200, 0, 0   The PC changes its PC/modem interface rate to 38400 bps and selects a compression method with the least sensitive setting with the goal of playing a message with less distortion, and at 7200 samples per second. (Assume that the PC issued a +VSM=? command earlier.)

OK   The modem agrees.

AT+VLS=4   The modem selects the speaker. The modem had earlier reported that a speaker was available.

OK   The modem agrees.

AT+VTX   The PC selects the Voice Transmit mode.

CONNECT   The modem agrees.

<Data>   The PC delivers <DLE> shielded and silence compressed voice data across the PC/modem interface.

<DLE> <ETX> The PC indicates the end of the Voice data stream.

OK   The modem indicates it is in Voice Command mode.

AT+VLS=0   The PC deselects all devices.

OK   The modem agrees.

           The PC switches to Data mode, Command mode, and autobauding enabled:
                    AT+VIT=0; +VPR=0; +FCLASS=0

OK   The modem agrees.

Answer Phone, Play Greeting Message, and Record Message Example

Command	Response
AT+FCLASS=8; AT+VIT=60; +VPR=16 OK	The DCE switches to Voice mode. The DTE selects a fixed DTE-DCE interface rate. The DTE knows from the sample rate selected earlier and the bits-Per--sample that the DTE-DCE interface rate should be 38400bps. The DTE-DCE Inactivity Timer starts with 60 seconds. DCE agrees (to the old DTE/DCE interface rate)
AT+VSM=129, 7200, 0, 0 OK	DTE changes its DTE/DCE rate to 38400 bps and selects a compression method with the least sensitive setting, with the goal of recording a message with less distortion, and at 7200 samples per second. Assume that the DTE issued a +VSM=? command earlier. DCE agrees
AT+VSD=127, 20 AT+VLS=0 OK	DTE selects a silence detection period of DTE selects a silence detection period of 2 seconds with the least sensitive setting (for detecting the end of voice recording). DCE agrees
AT+VIT=0; +FCLASS=0; S0=0 OK	The DTE selects the Data mode with autobauding, and disables+VPR=0; automatic DCE answering. The DCE waits for a phone call (not necessarily in Data mode). The DCE agrees.
RING AT+FCLASS=8; OK	At some time, a remote station calls. The DCE switches to Voice mode. The DCE selects a fixed AT+VIT=60; DTE/ DCE Interface Rate. The DTE knows from the sample AT+VPR=16; rate selected earlier and the bits per sample that the DTE/DCE Interface Rate should be 38400 baud. The DTE/DCE Inactivity Timer starts with a value of 60 seconds. The DCE agrees (at the old DTE/DCE Interface Rate).
AT+VLS=0 OK	The DTE selects all devices. The DCE agrees.
AT+VIT=0; +VPR=0; S0=0 AT+FCLASS=8; DTE/DCEAT+VIT=60; OK	The DTE selects Data mode/Command mode with autobauding, and disables automatic DCE answering. The +FCLASS=0; DCE waits for a phone call (not necessarily in Data mode). The DCE switches to Voice mode. The DCE selects a fixed Interface Rate. The DTE knows AT+VPR=16; from the sample rate selected earlier and the bits per sample that the DTE/DCE Interface Rate should be38400 baud. The DTE/DCE Inactivity Timer starts with a value of 60 seconds. The DCE agrees (at the old DTE/DCE Interface Rate).
<DLE> <R> AT+VLS=2 OK	The DCE selects another ring (at 38400 bps). The DCE answers the phone. The DCE indicates that it is in Voice Command mode.
AT+VTX CONNECT	The DTE selects Voice Transmit mode. The DCE agrees.

Command	Response
<Data> <DLE> <ETX> OK	The DTE plays the welcome message. The DTE indicates the end of the data stream. The DCE indicates that it is in Voice Command mode.
AT+VTS= {933, 0, 12} OK	The DTE annotates the greeting message with a 1.2 sec. beep. The DCE is ready for another Voice command.
AT+VSM=132, 7200, 0, 0 OK	The DTE selects a low bit compression scheme to save disk space. The DCE agrees.
AT+VRX CONNECT <Data> <DLE> <NUL> <DLE> </> <DLE> <5> <DLE> <5> <DLE> <-> <DLE> <!> <DLE> <ETX> AT+VNH=1 OK	The DTE selects the Voice Receive mode. The DCE agrees. The DCE delivers <DLE> shielded and silence-compressed voice dataacross the DTE/DCE interface. The DTE strokes the Inactivity Timer. The DCE reports the start of a possible DTMF tone. The DCE reports a DTMF 5 detection for 140 milliseconds (within a 70-millisecond resolution). The DCE reports the end of the DTMF 5 detection. For this example, DTMF 5 means "finish with the voice message, and switch to fax mode". The DTE wishes to end the record by sending an abort command. The DCE indicates the end of the Voice data stream, and returns to Voice Command Mode. The DTE selects to disable automatic hang-ups while in Service Class 2 +VIT=0 (+FSK command result codes in Telco on-hook). The DTE switches the +FCLASS=2 DCE to Service Class 2 fax mode. The DCE agrees.
ATA	The DCE starts the fax receive process.

DTE/DCE Interface Rates

The table below indicates the anticipated modem-to-computer interface rates for both the 7.2 bits-per-sample rate and the 8 bits-per-sample rate.

Projected DTE/DCE Interface Rates for 7.2/8K Hz Sample Rates

Projected DTE/DCE I/F Bits per Sample	Rate @ 7.2K Hz	Projected DTE/DCE I/F Rate @ 8K Hz Sample Rate
0.50	4800	9600
1	9600	19200
2	19200	19200
3	38400	38400
4	38400	57600
5	57600	57600
6	57600	115200
7	115200	115200
8	115200	115200
9	115200	115200
10	115200	115200
11	115200	115200
12	115200	Fast
13	Fast	Fast

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