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## XECOM APPLICATION NOTE:

### AT Command Drivers for Embedded Modems

Creating the code to drive an embedded modem is primarily a matter of sending the AT Commands from the host processor to the modem via the modem's serial port. The AT commands themselves are just ASCII text strings.

#### What are AT Commands?

AT" commands were developed in the early days of the Personal Computer to provide for the configuration and control of the installed modem. While there is no formalized standard for the AT commands, they generally do not vary substantially from manufacturer to manufacturer.

The AT command structure itself involves both commands and registers. In general the commands set the state of a single parameter. The registers come in two forms; those that select from a large number of potential values of a single parameter and bit-mapped registers which store the status of several commands.

#### Command Line Format

AT commands are sent to the modem in strings of ASCII text. These command strings follow a strict format. Each command begins with the prefix AT and is terminated by a carriage return. The command string is stored in the command buffer and can be edited using the backspace key at any time until the command is executed.

The "A" and "T" in the command prefix may be either both upper case or both lower case but cannot be of different cases. That is because these characters are used by the modem to automatically determine the data rate

and parity of the characters coming from the host controller. The modem determines data rate by measuring the width of the incoming bits. Parity is determined by comparing the parity bits of the "A" and the "T."

Multiple commands may be strung behind a single AT prefix. A single command string can contain up to 40 characters; spaces are ignored and not counted against the 40 character limit. Commands are executed in the sequence they appear. A carriage return terminates the command line and causes the commands to be executed. Register S3 allows the user to select a character other than a carriage return to terminate the command line.

#### What Commands to Use?

Which AT commands you need to exercise depends upon your application and how intelligent or dumb you want the modem operate. Below are some common questions to give you a better idea of what needs to be done.

Do you need the hardware handshaking signals; DSR and DTR? These signals can help you monitor and control the modem operation. If you intend to use these hardware handshaking signals, You must set the AT Commands that control their operation; AT&S and AT&D.

Do you intend to use in-band (XON/XOFF) or hardware (RTS/CTS) flow control? Hardware flow control is the factory default on most of Xecom's modems. Flow control is set by the AT&K command

How do you wish the modem to interact with the host controller? Do you need the commands sent to the modems to be echoed back to the

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controller? Command echo is controlled by the ATE command. What type of responses do you need from the modem; full words, abbreviated numeric responses, or maybe you do not need any response? The ATV and ATQ commands control the responses.

Are you going to be using the modem to answer incoming calls? If so, you need to select either Automatic answer (Register S0) or manual answer (ATA) operation. If you select manual answer you will need to check for an incoming ring either by modem response or by monitoring the RI hardware output line.

Originating calls requires use of the Dial command (ATD). Special modifiers can be used with the ATD command to select type of dialing (P for Pulse and T for Tone), pause for a second dial tone (,) and even dialing a stored number (S=n) in some models. You will need to decide which, if any, of these special dialing modifiers you want to utilize.

You will also need to decide at which data rates you want to connect. Particularly if you are using a 56K modem like Xecom's XE5620, you may not want to waste time connecting at lower data rates. This is one command that is not standardized. Check the data sheet of the modem you are using for the command which allows you to select acceptable data rates for all communications.

If you are changing any of the AT commands away from the factory default settings, you will need to issue an initialization string to the modem when power is applied to place the modem in the desired configuration. Some of Xecom's modems offer the option of storing the configuration in nonvolatile memory. This allows the modem to automatically reload your desired configuration each time power is applied. The AT&W command allows the active configuration to be placed in nonvolatile memory.

These are the most common configuration questions that arise, but by no means is this list comprehensive. Please contact Xecom Technical Support with any additional questions regarding the modem configuration for your application.

### **Xecom Technical Support Contacts.**

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