

# Modem Connection Control

## *For Remote Access Products*

Modem Connection Control is available with the *Ether232Plus*, the *Cell232Plus*, and the *IP232*. When you choose Modem as the method of Connection Control, the Precidia unit behaves like a Hayes, or “universal”, modem to the device connected on its serial port. The connected serial device (DTE) receives the expected modem replies when communicating with the Precidia device. To enable Modem Connection Control go to the Serial Port Settings sub-menu and choose **Modem** as the Connection Control option.

### Set-Up Notes

- Please note that using Modem as the method of Connection Control may change certain settings in the unit Configuration. Specifically, this includes the Session Mode portion of the Protocol configured in the Serial Port Settings [tcp(tunnel), tcp-client, tcp-server, or udp].
- For the Precidia unit to appear as DCE and behave as a modem you must use a *specialized null modem cable* to connect the Precidia unit to the serial device. This cable has the DSR and DCD pins tied together, as shown in the pinout below, and is available in various lengths through Cables To Go (part no.'s 03044, 03045, or 03046) and other resellers in North America.

Null Modem Cable Pinout	
DB-9 Female	DB-9 Female
2	3
3	2
4	1, 6
5	5
1, 6	4
7	8
8	7

- You can test the modem emulation of the Precidia unit, when not in configuration mode, by typing AT commands in your terminal software (HyperTerminal, Procomm Plus).

## Precidia Modem Overview

AT commands direct a modem to dial, answer, hang-up, and perform many other communication tasks. All commands listed, except A/ and +++, must be preceded by AT and followed with a carriage return. You can include multiple commands on a command line as long as it does not exceed 80 characters, including the prefix and carriage return. Spaces are ignored. Commands following a command that opens or closes an active connection are ignored.

A Dial command (ATD) instructs the modem to attempt a connection to the specified IP address and port number or, if none is specified, to the configured Remote IP in the Serial Port Settings sub-menu.

An On-Line command (ATO) instructs the modem to return to its active connection. If there is no active connection, the modem attempts to establish one using the configured Remote IP and Remote Port.

An Answer command (ATA) instructs the modem to listen on a specified port number. If no port number is specified, the configured local port number is used. If the local port is not set, the standard telnet port (23) is used.

The escape sequence (+++) causes the modem to return to command mode from answer or dial states, keeping the active connection open. An on-off transmission on the DTR line also causes the modem to return to command mode but the active connection may be maintained or closed, depending on how AT&D2 is defined.

The modem must be in command mode to receive commands. Any command sent to the modem while it is in transmission mode, other than the escape sequence (+++), is transmitted as data.

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**NOTE:** *If any characters arrive from the DTE while the modem is executing a command, such as ATA or ATD, that command is aborted.*

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## Supported AT Commands

Precidia supports a subset of the standard Hayes command set and a selection of extended commands, including the ability to initiate and perform FTP and HTTP transfers (see page 9). The following two tables describe the supported standard AT commands and the extended AT& and AT+ commands.

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**NOTE:** Only the options listed under Parameters are valid. Any unsupported standard command options return an OK result. Any unsupported non-standard commands return an error result. Options not required are ignored.

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**Table 1.1: Supported Commands**

Command Syntax	Description	Parameters
<b>A[pppp]</b>	<p>ANSWER. Allows the Precidia modem to listen for a connection or accept a connection on the provided port [pppp]. Successful connection returns “CONNECT &lt;speed&gt;” message. Otherwise modem waits indefinitely or until a key is pressed to cancel. If no port number is specified, the modem uses the configured Local Port. If Local Port is 0, the modem uses the standard telnet port (23).</p> <hr/> <p><b>NOTE:</b> If you set the Remote Password for telnet configuration, a telnet program is already listening on port 23; you will get an “ERROR” message.</p> <hr/> <p>Modem provides a “RING” message when an incoming connection is received and auto-answer is not active.</p>	<p>[pppp]</p> <p>The listening port number, range 0-65535</p>
<b>Dstring</b>	<p>DIAL. Attempts a connection to the specified IP address.</p> <p>If the IP is specified but port is not, the modem uses the telnet port (23).</p> <p>If a dial string is invalid or not specified, the modem uses the Remote IP and Remote Port.</p> <p>If Remote Port is 0, the modem uses the Fallback IP and Fallback Port.</p>	<p>string = aaa.bbb.ccc.ddd:pppp</p> <p>aaa.bbb.ccc.ddd is the IP address in standard notation</p> <p>pppp is the port number (0-65535)</p> <p>Note: Any non-digit can replace the “.” or “:”.</p>
<b>DS=n or DSn</b>	<p>DIAL STORED. Attempts a connection to a stored IP address and port number.</p>	<p>n = 0 (or no option present) uses Remote location</p> <p>n = 1 uses Fallback location</p>
<b>En</b>	<p>ECHO. Allows host commands to be echoed.</p>	<p>n = 0 (or no option present) will disable echo</p> <p>n = 1 enables command mode echo (default)</p>

**Table 1.1: Supported Commands**

<b>Command Syntax</b>	<b>Description</b>	<b>Parameters</b>
<b>Hn</b>	HOOK. Closes an open connection.	n = 0 (or no option present) will close an open connection.
<b>In</b>	INQUIRY. Displays information about the Precidia device.	n = 0 returns the product name n = 1 returns the product name, the company name, version string and Device ID n = 2 returns the information listed above, plus the IP addresses for device information, status, log history, company information and support.
<b>O</b>	ONLINE. Go on-line. Will return to an active connection if one exists (escaped from via the "+++" command) or originate a connection to the configured Remote host.	none
<b>Qn</b>	RESULT CODES DISPLAY. Allows you to choose whether result codes are displayed after each command.	n = 0 (or no option present) returns result codes n = 1 will not return result codes
<b>Sr=n</b>	SET REGISTER. Set value of register r to n.	r = register number Note: r cannot be greater than 14. Register S13 is reserved. See S-Registers on page 8. n = value to assign
<b>Sr?</b>	DISPLAY REGISTER. Inquiry about value of register r.	r = register number

**Table 1.1: Supported Commands**

Command Syntax	Description	Parameters
<b>Vn</b>	RESULT CODES FORMAT. Choose how result codes are returned.	n = 0 (or no option present) displays result codes in numeric form n = 1 displays result codes in verbose (text) form (default)
<b>Z</b>	RESET. Closes any active connection and resets the S-registers to their saved values.	none

**Table 1.2: Extended AT& and AT+ Commands**

Command Syntax	Description	Parameters
<b>&amp;Cn</b>	DCD CONTROL. Controls the behavior of the DCD line.  <i><b>NOTE:</b> The Precidia Device cannot drive the DCD line as it is DTE. You can override this by enabling the DSR line (AT&amp;S1 command) and using a null modem cable with pins 1 and 6 tied together on each end.</i>	n = 0 sets the DCD line as always active n = 1 sets the DCD line to follow the connection status (default)
<b>&amp;Dn</b>	DTR CONTROL. Sets how the Precidia device will react to changes in the DTR signal.	n = 0 ignore n = 1 DTR on-off transition returns modem to command mode and maintains the connection n = 2 DTR on-off transition returns modem to command mode and closes the connection (default) n = 3 on-off transition returns the modem to command mode, closes the connection, and resets the S-registers and command options to saved values (as with ATZ)

**Table 1.2: Extended AT& and AT+ Commands**

<b>Command Syntax</b>	<b>Description</b>	<b>Parameters</b>
<b>&amp;F</b>	LOAD FACTORY SETTINGS. Loads the default settings for commands and S- registers.	none
<b>&amp;Hn or &amp;Kn</b>	FLOW CONTROL. Sets the type of flow control used. The default is set in configuration.	n = 0 disables flow control n = 1, 3 selects hardware (CTS/RTS) flow control n = 2, 4 selects software (XON/XFF) flow control
<b>&amp;Sn</b>	DSR CONTROL. Sets how the modem drives the DSR signal.	n = 0 (or no option present) sets the DSR line as always active (default) n = 1 sets the DSR line to follow the connection status
<b>&amp;V</b>	VIEW PROFILE SETTINGS. Displays the command and S-register settings.	none
<b>&amp;W</b>	SAVE CONFIG. Writes the current configuration settings into memory. Includes the S-register values, command options, IP addresses and port numbers.	none
<b>&amp;Z?</b>	DISPLAY NUMBERS. Returns the currently configured Remote IP and Remote Port as “Stored Host #1: xxx.xxx.xxx.xxx:pppp” and the Fallback IP and Fallback Port as “Stored Host #2: xxx.xxx.xxx.xxx:pppp”.	none
<b>&amp;Zn=s</b>	STORE NUMBER. Stores an IP address and port number (in the form xxx.xxx.xxx.xxx:pppp) into either the Remote IP and Port or Fallback IP and Port locations.	n = 0 Stores as Remote IP and Port (primary location) n = 1 Stores as Fallback IP and Port

**Table 1.2: Extended AT& and AT+ Commands**

<b>Command Syntax</b>	<b>Description</b>	<b>Parameters</b>
<b>+Bn</b>	FALLBACK HOST. Enables or disables switchover to a fallback host in case of primary host connection failure. An ATD command always attempts a connection with the Remote IP (primary host). If FallBack IP is configured and enabled, upon failure to connect with the Remote IP the next ATD command attempts a connection with the Fallback IP. Regardless of whether a connection is established, the next ATD command re-attempts a connection to the Remote IP.	n=0 Disables switchover to fallback host. n=1 Enables switchover to fallback host.
<b>+Hn</b>	For IP232 and Cell 232 <i>Plus</i> only. NETWORK CONTROL. Establishes or drops PPP connections to the configured host.	n = 0 (or no option present) Terminates PPP connection n = 1 Establishes PPP connection
<b>+Pstring</b>	FTP PUT or HTTP PUT. Upload from Precidia modem to an FTP or HTTP server.*	string = ftp://[userid[:password]@]ipadr[:port]/path/file.ext
<b>+Gstring</b>	FTP GET or HTTP GET. Download from an FTP or HTTP server to the Precidia modem.*	string = ftp://[userid[:password]@]ipadr[:port]/path/file.ext

\* See page 9 for a description of FTP/HTTP procedures.

## Escape to Command Mode

The modem can be moved into command mode in one of two ways: sending the sequence (*pause*, *+++*, *pause*) to the serial port, or dropping the DTR signal (AT&Dn).

The first method, sending an escape sequence, moves the modem into command mode but keeps the connection active. The default escape character is “+” and is stored in register S2. The default pause value is the value of register S12 (20) multiplied by 20ms. You can change the defaults by setting the registers with your own values.

The second method, dropping the DTR signal, is not supported by hardware platforms that do not have a wire for the DTR signal. Additionally, the reaction to the DTR signal depends on how you configure the DTR setting using the &Dn command. See &Dn on page E-4 for DTR settings.

## S-Registers

Basic S-registers (S0–S12) store information used by the modem and communication software. Basic S-registers have predefined values. Extended S-registers (S13+) are used for storing command option values. The following table summarizes the values and purpose of Precidia-supported S-registers.

**Table 1.3: Precidia S-Register Definitions**

<b>"S" Register</b>	<b>Default (decimal)</b>	<b>Purpose</b>
S0	0	Zero value disables auto-answer. Any non-zero value enables auto-answer.
S1	0	Unused.
S2	43	Defines escape character. (+)
S3	13	Defines carriage return. Cannot be changed.
S4	10	Defines line feed. Cannot be changed.
S5	8	Defines backspace.
S6	3	Unused.
S7	60	Unused.
S8	2	Unused.
S9	6	Unused.
S10	7	Unused.
S11	70	Unused.
S12	50	Defines guard time in 20 ms increments.
S13	—	Reserved.
S14	3	FTP/HTTP timeout in seconds to a maximum of 60.

## Result Codes

A result code is returned after each command sequence. The modem is set by default to return result codes in verbose format. Result code format is set using the “Vn” command.

Numeric result codes display as: Numeric Code<CR>. Verbose result codes display as: <CR><LF>Verboce Code<CR><LF>.

Unsupported basic and extended (&) commands return the “OK” result code. Command sets starting with \*, +, or # (other than those in Table 1.2) return the “ERROR” result code. The following table summarizes the possible codes that result from AT commands.

**Table 1.4: Result Codes**

Code	Verbose	Meaning
0	OK	Command executed without error.
1	CONNECT	Active connection established with host.
2	RING	A connection to the local port is requested.
3	NO CARRIER	Connection refused, broken, or closed.
4	ERROR	Illegal command. Error in command line.
5	CONNECT <speed>	Active connection established with host, connection speed in bps.
6	NO DIALTONE	Unable to make a connection attempt.
7	BUSY	Unused.
8	NO ANSWER	No response from host.

## Using the FTP/HTTP Client

The Precidia modem supports an FTP and HTTP client through the use of proprietary extended AT commands. FTP is defined in RFC959 and HTTP is defined in RFC2616 (available at <http://www.rfc-editor.org/>).

### Configuration

You must configure the Precidia unit’s Ethernet (IP Address, Subnet Mask, Gateway) or PPP Dial-up settings (Modem Dial, Login Userid, Modem Chatscript). You also need to configure the Serial Port settings (Protocol, Port Speed, Connection Control), with Connection Control set to "Modem".

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**NOTE:** To initiate a file upload, the extended AT command uses the same syntax used for FTP in Web browsers (standard URL format).

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## Extended FTP AT Commands

**Table 1.5: FTP Commands**

<b>Command Syntax</b>	<b>Description</b>	<b>Parameters</b>
+Pstring	FTP PUT or HTTP PUT. Upload from Precidia modem to an FTP or HTTP server.	string = ftp://[userid[:password]@]ipadr[:port]/path/file.ext
+Gstring	FTP GET or HTTP GET. Download from an FTP or HTTP server to the Precidia modem.	string = ftp://[userid[:password]@]ipadr[:port]/path/file.ext

### FTP/HTTP Transfers

The "userid", "password", and "port" fields can all be omitted; default values of "anonymous", "serialport@precidia.device", and "21" (FTP) or "80" (HTTP) are used.

When the DTE device gets a CONNECT result, it streams data to the serial port and the Precidia modem will send that data as an FTP or HTTP file transfer to the server.

The transfer is considered complete when there is no data from the terminal for the number of seconds specified in register S14, or the DTR line is dropped (hung-up). Upon completion, an OK result is sent back to the DTE, and the Precidia modem returns to command mode. Note that &D must be set to 1, 2, or 3 for dropping DTR to function correctly.

If there were any errors during the transfer the Precidia modem sends an ERROR message.

Any characters received on the serial port before the CONNECT message will terminate the connection attempt (just as they would on a standard ATD command).

## Result Codes

The CONNECT result code appears when the FTP/HTTP session is established and the Precidia modem is ready to move data. Possible result codes are described in the following table.

**Table 1.6: FTP Result Codes**

<b>Result Code</b>	<b>Meaning</b>
CONNECT	FTP/HTTP session established.
NO CARRIER	Connection is broken or closed
NO DIALTONE	No route exists to the requested host
NO ANSWER	Host ignored or refused the connection
ERROR	Bad URL, user, password, etc.

### Tips

- If you put a "1" after the +P but before the URL string, the connection will be "verbose" and all connection messages from the server will also appear on the serial port. Useful for troubleshooting.
- We recommend placing "&H1" between the "AT" and the "+P" or "+G" to make sure that hardware handshaking is enabled before sending data. This option can also be explicitly set in the Precidia modem configuration.

