

# Modem AT Commands

This technical note outlines compatible AT commands that may be used with PowerLogic® ION meters equipped with the internal modem option. AT commands control a modem’s operation and are useful for setting up the modem (for example, if you want to turn off the modem’s autoanswer feature). All AT commands begin with the characters **AT**, which is short for “attention code”. This is what alerts the modem that a command is following immediately.

**⚠ CAUTION**

Adding, removing or changing AT commands should only be performed by qualified individuals. Putting improper code in the modem configuration string could cause the modem to become inoperable.

Depending on the ION meter and its date of manufacture, the installed optional internal modem could be one of two different brands. The Conexant modem is the older type modem, and is available in North American (FCC approved) or European (CTR-21 compliant) versions. The newer modem is manufactured by Multi-Tech and is a universal modem that can be readily used in most countries, and complies with FCC, Industry Canada and TBR-21 regulations.

Contained in this document is a section explaining how you can determine which type of modem is installed on your ION meter, a section that lists AT command sets for the new (Multi-Tech) modem, and a section that lists AT command sets for the older (Conexant) modems.

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### Additional Information

- ◆ Your meter’s technical documentation
- ◆ *ION Reference*

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# ION Meter Internal Modem Types

The change to the internal modem installed in ION meters began during mid-third quarter of 2001. This switchover is traceable to the meter and its serial number.

The serial number follows the format `xx-YYMMxNNN-xx`, where YY is the year of manufacture, MM is the month of manufacture, and NNN is the unit number (i.e. the  $n^{\text{th}}$  unit manufactured during the YYMM period). YY=01 indicates the year 2001, MM=01 indicates January and MM=12 indicates December.

ION meter	Starting serial number for units equipped with new Multi-Tech modem
ION 7550	All serial numbers
ION 7650	All serial numbers
ION7700	PM-0111B005-06
ION8300	PS-0108A012-01
ION8400	PR-0108A156-02
ION 8500	PQ-0108A003-03

Use the above table to determine which internal modem is equipped in your ION meter. If YYMM on your meter's serial number is lower than what is listed in the table, then your meter is equipped with the older (Conexant) modem. If YYMM on your meter's serial number is higher than what is listed in the table, then your meter is equipped with the newer (Multi-Tech) modem.

If YYMM on your meter's serial number is the same as what is listed in the table, then use NNN to compare — if NNN on your meter's serial number is lower than what is listed in the table, then your meter is equipped with the older (Conexant) modem; if it is higher, then your meter is equipped with the newer (Multi-Tech) modem.

# Multi-Tech Modems in ION Meters

The Multi-Tech ModemModule is the newer-type modem equipped in ION meters that are ordered with the internal modem option. The Multi-Tech modem is compatible with most telephone systems in the world, with the exception of Australia and New Zealand.

## Multi-Tech Internal Modem Settings

Since the Multi-Tech modem are universally compatible with most telephone systems, no further reconfiguration of the default settings should be necessary.

### International support

In some cases, the default initialization string for the internal (Multi-Tech) modem may need to be changed depending on the country it is used in. Countries not listed below are compatible with the default (North American) settings:

- ◆ Hong Kong, Hungary, India, Indonesia, Israel, Korea, Malaysia, Philippines, Poland, Singapore, Slovenia and Vietnam  
`AT%T19,0,30`
- ◆ Czech Republic  
`AT%T19,0,25`
- ◆ Japan  
`AT%T19,0,10`

## AT Commands for the Multi-Tech Modem

The following table summarizes the compatible AT commands for ION meters equipped with the Multi-Tech internal modems:

Command		Values	Default	Description
AT	Attention Code	n/a		The attention code precedes all command lines except A/, A:, and escape sequences.
A/	Repeat Last Command	n/a		Repeat the last command string. Do not precede this command with AT. Do not press ENTER to execute.
Bn	Communication Standard Setting	n = 0-3, 15, 16	1 and 16	B0 Select ITU-T V.22 mode when modem is at 1200 bps. B1 Select Bell 212A when modem is at 1200 bps. B2 Deselect V.23 reverse channel (same as B3). B3 Deselect V.23 reverse channel (same as B2). B15 Select V.21 when the modem is at 300 bps. B16 Select Bell 103J when the modem is at 300 bps.
Nn	Modulation Handshake	n = 0 or 1	1	N0 Modem performs handshake only at communication standard specified by S37 and the B command. N1 Modem begins handshake at communication standard specified by S37 and the B command. During handshake, fallback to a lower speed can occur.

Command		Values	Default	Description
P	Pulse Dialing	P, T	T	Configures the modem for pulse (non-touch-tone) dialing. Dialed digits are pulsed until a T command or dial modifier is received.
Sr=n	Set Register Value	r = S-register number; n varies	None	Set value of register Sr to value of n, where n is entered in decimal format. E.g., S0=1.
T	Tone Dialing	P, T	T	Configures the modem for DTMF (touch-tone) dialing. Dialed digits are tone dialed until a P command or dial modifier is received.
&Gn	V.22bis Guard Tone Control	n = 0, 1, or 2	0	&G0 Disable guard tone. &G1 Set guard tone to 550 Hz. &G2 Set guard tone to 1800 Hz. Note: The &G command is not used in North America.
&Pn	Pulse Dial Make-to-Break Ratio Selection	n = 0, 1, or 2	0	&P0 60/40 make-to-break ratio &P1 67/33 make-to-break ratio &P2 20 pulses per second Note: The &P2 command is available only if the country code is set to Japan.
&Qn	Asynchronous Communications Mode	n = 0, 5, 6, 8, or 9	5	&Q0 Asynchronous with data buffering. Same as \N0. &Q5 Error control with data buffering. Same as \N3. &Q6 Asynchronous with data buffering. Same as \N0. &Q8 MNP error control mode. If MNP error control is not established, the modem falls back according to the setting in S36. &Q9 V.42 or MNP error control mode. If neither error control is established, the modem falls back according to the setting in S36.
\An	Select Maximum MNP Block Size	n = 0, 1, 2, or 3	3	\A0 64-character maximum. \A1 128-character maximum. \A2 192-character maximum. \A3 256-character maximum.
\Nn	Error Correction Mode Selection	n = 0-5, or 7	3	\N0 Non-error correction mode with data buffering (buffer mode; same as &Q6). \N1 Direct mode. \N2 MNP reliable mode. If the modem cannot make an MNP connection, it disconnects. \N3 V.42/MNP auto-reliable mode. The modem attempts first to connect in V.42 error correction mode, then in MNP mode, and finally in non-error correction (buffer) mode with continued operation. \N4 V.42 reliable mode. If the modem cannot make a V.42 connection, it disconnects. \N5 V.42, MNP, or non-error correction (same as \N3). \N7 V.42, MNP, or non-error correction (same as \N3).
\Tn	Inactivity Timer	n = 0, 1-255	0	Sets the time (in minutes) after the last character is sent or received that the modem waits before disconnecting. A value of zero disables the timer. Applies only in buffer mode. Note: You can also set the inactivity timer by changing the value of S30.
-Cn	Data Calling Tone	n = 0 or 1	0	-C0 Disable V.25 data calling tone to deny remote data/fax/voice discrimination. -C1 Enable V.25 data calling tone to allow remote data/fax/voice discrimination.
%Cn	Data Compression Control	n = 0 or 1	1	%C0 Disable V.42bis/MNP 5 data compression. %C1 Enable V.42bis/MNP 5 data compression.

Command		Values	Default	Description
%En	Fallback and Fall Forward Control	n = 0, 1, or 2	2	%E0 Disable fallback and fall forward. %E1 Enable fallback, disable fall forward. %E2 Enable fallback and fall forward.
\$MBn	Online BPS Speed	n = speed in bits per second	28,800	\$MB75 Selects CCITT V.23 mode \$MB300 Selects 300 bps on-line \$MB1200 Selects 1200 bps on-line \$MB2400 Selects 2400 bps on-line \$MB4800 Selects 4800 bps on-line \$MB9600 Selects 9600 bps on-line \$MB14400 Selects 14,400 bps on-line \$MB19200 Selects 19,200 bps on-line \$MB28800 Selects 28,800 bps on-line \$MB33600 Selects 33,600 bps on-line
\$\$Bn	Serial Port Baud Rate	n= speed in bits per second	115200	\$\$B300 Selects 300 bps at serial port \$\$B1200 Selects 1200 bps at serial port \$\$B2400 Selects 2400 bps at serial port \$\$B4800 Selects 4800 bps at serial port \$\$B9600 Selects 9600 bps at serial port \$\$B19200 Selects 19,200 bps at serial port \$\$B38400 Selects 38,400 bps at serial port \$\$B57600 Selects 57,600 bps at serial port \$\$B115200 Selects 115,200 bps at serial port \$\$B230400 Selects 230,400 bps at serial port

## S-Registers

S-registers are memory locations that store certain modem values or parameters. **S commands** are used to read or alter the contents of S-registers.

Register	Unit	Range	Default	Description
S6	seconds	2-65*	2*	Sets the time the modem waits after it goes off-hook before it begins to dial the telephone number.
S7	seconds	1-255*	50*	Sets the time the modem waits for a carrier signal before aborting a call. Also sets the wait for silence time for the @ dial modifier.
S8	seconds	0-65	2	Sets the length of a pause caused by a comma character in a dialing command.
S10	100 ms	1-254	20	Sets how long a carrier signal must be lost before the modem disconnects.
S11	1ms	50-150*	95*	Sets spacing and duration of dialing tones.
S28	decimal	0, 1-255	1	0 disables, 1, 255 enables V.34 modulation.
S30	1 minute	0, 1-255	0	Sets the length of time that the modem waits before disconnecting when no data is sent or received. A value of zero disables the timer. See also the \T command
S35	decimal	0-1	0	0 disables, 1 enables the V.25 calling tone, which allows remote data/fax/voice discrimination.
S36	decimal	0-7	7	Specifies the action to take in the event of a negotiation failure when error control is selected. (See S48.)

Register	Unit	Range	Default	Description
S37	decimal	0-19	0	<p>Sets the maximum V.34 i°upstreami± speed at which the modem attempts to connect.</p> <p>0 = maximum speed            1 = reserved            2 = 1200/75 bps            3 = 300 bps            4 = reserved            5 = 1200 bps            6 = 2400 bps            7 = 4800 bps            8 = 7200 bps            9 = 9600 bps            10 = 12000 bps            11 = 14400 bps            12 = 16800 bps            13 = 19200 bps            14 = 21600 bps            15 = 24000 bps            16 = 26400 bps            17 = 28800 bps            18 = 31200 bps            19 = 33600 bps</p>
S43	decimal	0-1	1	<p>For testing and debugging only. Enables/disables V.32bis start-up auto mode operation. 0 = disable; 1 = enable.</p>
S48	decimal	7 or 128	7	<p>Enables (7) or disables (128) LAPM negotiation. The following lists the S36 and S48 configuration settings for certain types of connections.</p> <p>S48=7            S36=0, 2 LAPM or hang up            S36=1, 3 LAPM or async            S36=4, 6 LAPM, MNP, or hang up            S36=5, 7 LAPM, MNP, or async</p> <p>S48=128            S36=0, 2 Do not use            S36=1, 3 Async            S36=4, 6 MNP or hang up            S36=5, 7 MNP or async</p>

# Conexant Modems in ION Meters

Some ION meters that are ordered with the internal modem option are equipped with the older type Conexant modem. To find out what type of modem your meter has, refer to the section, "ION Meter Internal Modem Types".

## AT Commands for the Conexant Modem

The following lists the AT commands that are compatible with ION meters equipped with the Conexant internal modem.

Command Group		Members	Description
Bn	Select CCITT or BELL Mode	ATB0	CCITT Mode
		ATB1	BELL Mode (default)
Sn	Read/Write S-Register	ATSn=v	Sets S-Register n to the value v
&Fn	Restore Factory Configuration (Profile)	AT&F0	Restore factory configuration 0
		AT&F1	Restore factory configuration 1
&Gn	Select Guard Tone	AT&G0	Disables guard tone (default)
		AT&G1	Disables guard tone
		AT&G2	Selects 1800 Hz guard tone
%Cn	Enable/Disable Data Compression	AT%C0	Disables data decompression
		AT%C1	Enables MNP 5 data compression negotiation
		AT%C2	Enables V.42 bis data compression
		AT%C3	Enables both V.42 bis and MNP 5 data compression
%En	Enable/Disable Line Quality Monitor & Auto-Retrain or Fallback/Fall Fwd	AT%E0	Disable line quality
		AT%E1	Enable line quality monitor and auto-retrain
		AT%E2	Enable line quality monitor and fallback/fall forward
\An	Select Maximum MNP Block Size	AT\A0	64 characters
		AT\A1	128 characters (Default)
		AT\A2	192 characters
		AT\A3	256 characters
\Nn	Operating Mode	AT\N0	Normal speed buffered mode
		AT\N1	Serial interface
		AT\N2	Reliable (error-correction) mode
		AT\N3	Auto reliable mode
		AT\N4	LAPM error-correction mode
		AT\N5	MNP error-correction mode

## AT+MS Commands Select Modulation

Selects the modulation; enables or disables auto-mode; specifies the lowest and highest connection rates; selects m-Law or A-Law codec type, and enables or disables robbed bit signaling generation (server modem) or detection (client modem).

```
+MS= <Mod> [, [<Automode>] [, [<Min_Rate>] [, [<Max_Rate>] [, [<X_Law>]
[ [<Rb_Signaling>]]]]]] <CR>
```

**AT+MS=?** Send a string of information to the DTE consisting of supported options

<mod>	Modulation	Possible Rates (bps)
0	V.21	300
1	V.22	1200
2	V.22 bis	2400, 1200
3	V.23	1200
9	V.32	9600, 4800
10	V.32 bis	14400, 12000, 9600, 7200, 4800
11	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400
64	Bell103	300
69	Bell212	1200



# Changing the Internal Modem Settings

To reconfigure the ION meter's internal modem, access its setup register:

- ◆ **Using ION Enterprise®:**  
In Designer, right-click the internal modem's Comm module (inside the Communications Setup group).
- ◆ **Using ION Setup:**  
Double-click the Comm module icon for the meter's internal modem. If you cannot see the module, right-click the meter icon. In the Device Properties dialog box, click the Tools tab, then select "Show Advanced ION Setup" in the Device Setup box. Click OK.

# Changing the Local Modem Settings

## Using PEGASYS or ION Setup software:

PEGASYS and ION Setup use the modem.ini file to define how the local modem should behave whenever modem communication is initiated. The modem.ini file contains information that sets the local modem to the specified baud rate and turns compression and error correction off. This particular setting is useful only if there are 3700 Series meters connected to the ION meter's internal modem communications loop (through ModemGate). If only ION meters are used, we recommend that only the minimum required modem.ini settings be used (i.e. **Q0 E0 V1 &K0**).

Use a standard text editing software like Notepad to make changes to the modem.ini file.

## Using ION Enterprise software:

ION Enterprise uses database queries to configure the local modem settings. Database queries are beyond the scope of this technical note. If you want to learn how to configure the local modem using ION Enterprise, please contact Schneider Electric Technical Support.

# Cellular Phone Compatibility

Using analog cellular phones to communicate with a meter equipped with a modem is not recommended due to the inherent unreliability of cellular phone communication. However, if cellular phone-to-meter communication is necessary, we recommend the following setup:

## For compatibility with the (newer) Multi-Tech internal modem:

- ◆ **Local modem:** Multi-Tech 5600ZDX or GVC 56K (also possible with other Conexant chipset based modems)
- ◆ **Necessary AT commands:** +MS=11,1,1200,4800\N2
- ◆ **Description:** This setup forces v.34 at maximum 4800 baud and forces error correction. This also ensures other AT commands do not turn off error correction and compression. The 4800 setting may be increased to 7200/9600, but in most cases, using 4800 results in better throughput due to less errors for the modems to deal with.

For the above application, the following are recommended modem initialization string changes for the Multi-Tech modem (inside the ION meter):

**AT command:** S10=100

**Description:** Increases disconnect time on loss of carrier

**AT command:** B1

**Description:** If rate drops to 1200, use Bell protocol

## For compatibility with the (older) Conexant internal modem:

- ◆ **Local modem:** Black Box MiniModem 56k Data/Faxmodem, model MD1620A, or Multi-Tech MultiModem, model MT5600ZDX
- ◆ **Necessary AT commands:** %E0-K1-SEC=1+MS=10,1,1200,9600
- ◆ **Description:** This setup allows the modem to negotiate any baud rate between 1200 and 9600 bps. This setup also prevents v.34 connections by not allowing the modem to negotiate anything higher than V32bis.

For the above application, the following are recommended modem initialization string changes for the Conexant modem (inside the ION meter):

**AT command:** AT%E0-K1-SEC=1+MS=10,1,1200,9600

In addition, the modem site needs to be set up as follows, regardless of the actual connection baud rate:

- ◆ Modem Type: Black Box MiniModem 56k Data/Fax
- ◆ Transmit Delay: 10 ms
- ◆ Baud Rate: 9600 bps
- ◆ RTS/CTS: unchecked
- ◆ Receive Timeout: 5000 ms
- ◆ Byte Timeout: 20 byte-time