



Upgrading the Initialization String in an MDM-TEL Industrial Modem

Abstract: This technical note describes differences between the AT commands supported in current and previous revisions of the MDM-TEL Self-Dialing Modem. This Technical Note is intended to aid existing customers in identifying and dealing with potential issues in converting to the newer revision products.

Note: New modem wizard users (those not specifying their own init or AT strings) will find complete information in the product documentation and should have no need for the information in this document.

Equipment affected:

- MDM-TEL Self-Dialing Modem

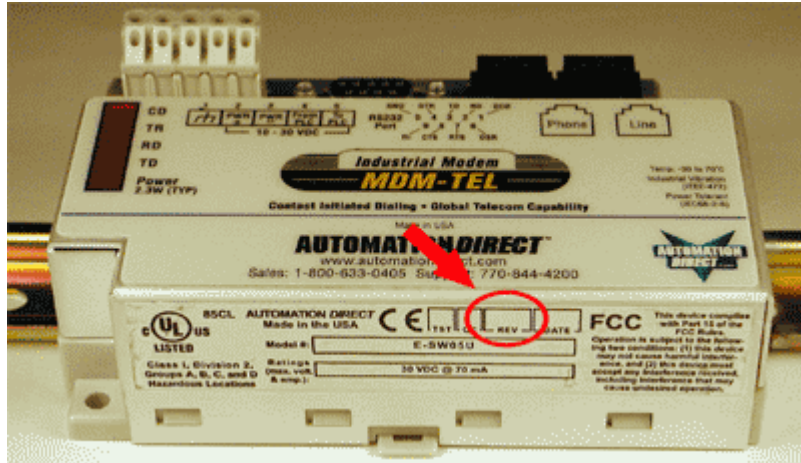
Software used:

- Industrial Modem Wizard v2.03 or greater
- Windows HyperTerminal

Identifying the modem you have:

This section will show how to identify what revision of modem you have.

1. The Industrial Modem Wizard will also detect the version of the modem you have. Open the Wizard and detect the modem you are connected to by selecting the COM port your modem is connected to and clicking the red bar at the top of most configuration screens. The firmware version of your modem is indicated as Rev 1, Rev 2 or Rev 3, otherwise the difference is seamless to the typical Wizard user (See Appendix A).
2. On the back of the modem there is a white sticker called the back label that indicates among other things the revision number (Rev) and modem models. Please see the tables below to see how to interpret this number.



3. You can also detect the modem type using HyperTerminal. Please see the last section of this technical note for pointers on how to configure HyperTerminal to send AT commands to modem. To query the firmware version enter the **ati3<enter>**. Please see the tables below for information on how to interpret this firmware rev number.

Self-Dialing Modem

Modem Wizard	Rev 1	Rev 2	Rev 3
Back Label	1.00-1.04, 1.06-1.08	1.04/1.05	2.00
HyperTerminal (ati3)	V2.100-V34_2M_DLS	P2109-V90	CX81802-V34

AT command differences and how to change your initialization string:

This section defines some of the commonly used AT commands and notes the difference in the way they are implemented in different Revisions of the modem. This section refers to the modems using the Industrial Modem Wizard's notation of Rev 1, Rev 2 and Rev 3 (see the section above).

1. The S37 and N command versus the +MS command to set the modem's line speed

Rev 1 modem: S37=n is used to set the desired line connection speed.

Where n =

1-3	Attempt to connect at 300 bps
5	Attempt to connect at V.22 1200 bps
6	Attempt to connect at V.22 bis 2400 bps
7	Attempt to connect at V.23.
8	Attempt to connect at V.32 bis/V.32 4800 bps
9	Attempt to connect at V.32 bis/V.32 9600 bps
10	Attempt to connect at V.32 bis 12000 bps
11	Attempt to connect at V.32 bis 14400 bps
12	Attempt to connect at V.32 bis 7200 bps

The N command sets the Automode command, which determines the way the modem will attempt to negotiate the modem-to-modem speed.

N0	Automode detection is disabled. Sets the fixed modem-to-modem speed. The modem will only try to negotiate the phone line speed defined in S37.
N1	Automode detection is enabled. Sets the Auto-Detect modem-to-modem speed. The modem will first attempt to negotiate at the speed defined in S37. If the modem is unsuccessful in negotiating the connection the modem will progressively try lower and lower baud rates down to 300 baud (Default).

Example: AT S37=9 N0<enter> will set the modem-to-modem speed to be fixed at 9600.

The Rev 1 modem also supports these parameters in another command originally developed as a reporting feature. This command is the +MS command and is defined as:

This extended format command selects the modulation, optionally enables or disables automode, and optionally specifies the lowest and highest connection rates two optional sub-parameters.

The command format is:

+MS= <mod>,<automode>,<min_rate>,<max_rate>

<mod>	Modulation	<min_rate>,<max_rate> Possible Rates (bps)
0	V.21	300
1	V.22	1200
2	V.22 bis	2400 or 1200
3	V.23	1200
9	V.32	9600 or 4800
10	V.32 bis	14400, 12000, 9600, 7200, or 4800
11	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 40000, 38000, 36000, 34000, 32000
64	Bell 103	300
69	Bell 212	1200

<automode>	Option Selected
0	Automode disabled. Sets fixed speed. The modem will only try to connect at that speed.
1	Automode enabled without V.8 (except for V.34). Sets Auto-Detect speed. The will first try to connect at the highest speed defined in the string, then step down until it is successful in negotiating a speed.
2	Automode enabled with V.8 for any applicable modulation. Sets Auto-Detect speed. Same as N1. Not typically used.

Example: AT+MS=11,0,9600,9600<enter> is the equivalent to ATS37=9N0<enter> command.

The table below has a complete list of all the modem-to-modem speed settings in auto-detect and fixed modes For the Rev 1 modems. These settings can be set through the Industrial Modem Wizard by simply clicking a radio button and selecting a speed or the string can be manually typed using HyperTerminal (See the last section in this document about using HyperTerminal).

Auto-Detect Speed Settings	Commands listed below should all include an AT+MS= at the beginning	Fixed Speed Settings	Commands listed below should all include an AT+MS= at the beginning
300	0,1,300,300	300	0,0,300,300
1200	2,1,300,1200	1200	2,0,1200,1200
2400	11,1,300,2400	2400	11,0,2400,2400
4800	11,1,300,4800	4800	11,0,4800,4800
9600	11,1,300,9600	9600	11,0,9600,9600
14400	11,1,300,14400	14400	11,0,14400,14400
19200	11,1,300,19200	19200	11,0,19200,19200
28800	11,1,300,28800	28800	11,0,28800,28800
33600	11,1,300,33600	33600	11,0,33600,33600

Important Note: While using HyperTerminal or an initialization string to enter the modem-to-modem speed settings to the modem's memory an AT&W0<enter> must be entered after the +MS command. The AT&W0 command cannot be entered in the same line as the +MS command.

Example: AT+MS=11,0,9600,9600&W0<enter> is not a valid AT command, but AT+MS=11,0,9600,9600<enter> and AT&W0<enter> are valid.

Rev 2 modem: In place of S37 and N the Rev 2 modem uses only the +MS command. The +MS command is defined as:

+MS=<mod>,<automode>,<Min TX and RX rate>,<Max TX and RX rate>

The only difference between the Rev 1 and Rev 2 is the way the modulation is applied. Instead of the Rev 1's numeric modulation the Rev 2 uses an alpha-numeric modulation. Compare the <mod> field definition table below with the Rev 1 table.

<mod>	Modulation	<Min TX and RX rate>, <Max TX and RX rate> Possible Rates (bps)
B103	Bell 103	300
B212	Bell 212	1200 Rx/75 Tx or 75 Rx/1200 Tx
V21	V.21	300
V22	V.22	1200
V22B	V.22 bis	2400 or 1200
V23C	V.23	1200
V32	V.32	9600 or 4800
V32B	V.32 bis	14400, 12000, 9600, 7200, or 4800
V34	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400

Example: AT+MS=V34,0,9600,9600 is equivalent to the Rev 1's AT+MS=11,0,9600,9600 and ATS37=9N0 string.

The table below has a complete list of all the modem-to-modem speed settings in auto-detect and fixed modes used for the Rev 2 modem. These settings can be set through the Industrial Modem Wizard by simply clicking a radio button and selecting a speed or the string can be manually typed using HyperTerminal (See the last section in this document about using HyperTerminal).

Auto-Detect Speed Settings	Commands listed below should all include an AT+MS= at the beginning	Fixed Speed Settings	Commands listed below should all include an AT+MS= at the beginning
300	V21,1,300,300	300	V21,0,300,300
1200	V22B,1,300,1200	1200	V22B,0,1200,1200
2400	V34,1,300,2400	2400	V34,0,2400,2400
4800	V34,1,300,4800	4800	V34,0,4800,4800
9600	V34,1,300,9600	9600	V34,0,9600,9600
14400	V34,1,300,14400	14400	V34,0,14400,14400
19200	V34,1,300,19200	19200	V34,0,19200,19200
28800	V34,1,300,28800	28800	V34,0,28800,28800
33600	V34,1,300,33600	33600	V34,0,33600,33600

Rev 3 modem: Is almost implemented exactly the same as the Rev 2 modem with one exception. There are now separate TX and RX speed settings. The +MS command is defined as:

+MS=<mod>,<automode>,<Min TX rate>,<Max TX rate>,<Min RX rate>,<Max RX rate>

So to send the command to lock the speed in at 9600 with V.34 modulation you should enter:

AT+MS=V34,0,9600,9600,9600,9600<enter>

Example: +MS=V34,0,9600,9600,9600,9600 is equivalent to the Rev 1's AT+MS=11,0,9600,9600 and the Rev 2's AT+MS=V34,0,9600,9600.

The table below has a complete list of all the modem-to-modem speed settings in auto-detect and fixed modes used for the Rev 3 modem. These settings can be set through the Industrial Modem Wizard by simply clicking a radio button and selecting a speed or the string can be manually typed using HyperTerminal (See the last section in this document about using HyperTerminal).

Auto-detect speed Settings	Commands listed below should all include an AT+MS= at the beginning	Fixed Speed Settings	Commands listed below should all include an AT+MS= at the beginning
300	V21,1,300,300,300,300	300	V21,0,300,300,300,300
1200	V22B,1,300,1200,300,1200	1200	V22B,0,1200,1200,1200,1200
2400	V34,1,300,2400,300,2400	2400	V34,0,2400,2400,2400,2400
4800	V34,1,300,4800,300,4800	4800	V34,0,4800,4800,4800,4800
9600	V34,1,300,9600,300,9600	9600	V34,0,9600,9600,9600,9600
14400	V34,1,300,14400,300,14400	14400	V34,0,14400,14400,14400,14400
19200	V34,1,300,19200,300,19200	19200	V34,0,19200,19200,19200,19200
28800	V34,1,300,28800,300,28800	28800	V34,0,28800,28800,28800,28800
33600	V34,1,300,33600,300,33600	33600	V34,0,33600,33600,33600,33600

The +H command to enable/disable RPI (Rockwell Protocol Interface)

Rev 1 modem: If you are a long time customer of the Rev 1 modem you may already be accustomed to using the +H command. This command is used to enable/disable Rockwell Protocol Interface and set the DTE (modem serial port) speed. This command is defined as:

- +H0 Disable protocol interface and video ready mode.
- +H1 Enable RPI mode and set DTE speed to 19200 bps.
- +H2 Enable RPI mode and set DTE speed to 38400 bps.
- +H3 Enable RPI mode and set DTE speed to 57600 bps.
- +H11 Enable RPI+ mode. When in RPI+ mode, a link is established between the modem and the WinRPI or WinRPI95 host PC software driver to allow the modem to support protocol (V.42bis/LAP-M/MNP2-5) connections with a remote modem. This command should only be used when the WinRPI or WinRPI95 driver software is installed in the PC.
- +H16 Enable video ready mode

The website www.TheFreedictionary.com by Farlex defines Rockwell Interface Protocol (RPI) as, “a cutting edge feature of some modems allowing data compression and error correction (e.g. ITU-T V.42bis, V.42) to be provided in software instead of hardware.”

“Usually an RPI modem comes with RPI-aware software (e.g. the low-end RPI models of Supra come with the COMit which supports RPI, providing MNP 2,4,5,7, V.42 and V.42bis). RPI is not supported by many commercial packages nor by current releases of popular shareware communication programs (Telix v3.22 and Telemate v4.12). ProComm Plus for Windows 2.0 will support RPI.”

AutomationDirect does not provide “RPI-aware” software, and does not support the RPI feature in the Industrial Modem product line. In fact, most applications that use this command probably use it only to disable RPI (AT+H0). To set the DTE parameters use AT<enter> or AT&W0<enter>. Using the AT attention commands the modem will automatically detect the baud rate, data bits, parity and stop bits of the AT command sent. When just AT<enter> is sent the modem will use the detected parameters until power is cycled or until another AT<enter> or AT&W0<enter> is sent at different parameters. When AT&W0<enter> is sent the modem will use the detected parameter until another AT<enter> or AT&W0<enter> is sent at different parameters.

Rev 2 and 3 modems: The Rev 2 and 3 modems do not support the RPI feature at all, so there is no need to use this command in any AT command strings for this modem. Do not include the +H command in AT commands sent to the Rev 2 and 3 modems because the modems will return an ERROR.

2. The #BDR command sets the modems serial (DTE) speed and automode

Rev 1 modem: The #BDR command forces the modem to select a specific DTE/modem baud rate without further speed sensing on the interface. When a valid #BDR=n command is entered, the OK result code is sent at the current assumed speed. After the OK has been sent, the modem switches to the speed indicated by the #BDR=n command it has just received.

Parameters:

n = 0 – 48 (New baud rate is n*2400 bps)

Default:

0

Result Codes:

OK For the supported speeds.

ERROR Otherwise.

Command options:

#BDR? Returns the current setting of the #BDR command as an ASCII decimal value in result code format.
#BDR=? Returns a message indicating the speeds that are supported.
#BDR=0 Enables auto-baud detection on the DTE interface.
#BDR=n Where 1<n<48. Sends OK message at current speed, then switches to the new speed defined by n*2400 bps unless and until another #BDR=n command is received. Auto-baud is disabled, and the character format is maintained at the format most recently detected.

Example: AT#BDR=4<enter> sets the DTE speed to 9600 and auto baud is disabled.

Rev 2 and Rev 3 modems: The #BDR command has changed to the +VPR in the Rev 2 and Rev 3 modems. The +VPR command is implemented exactly the same way as the #BDR command. If you are using #BDR in your modem simply replace '#BDR' for '+VPR.'

Valid commands are:

0 = Auto-baud
1 = 2400 bps
2 = 4800 bps
3 = 7200 bps
4 = 9600 bps
8 = 19200 bps
16 = 38400 bps
24 = 57600 bps
48 = 115200 bps
96 = 230400 bps

Example: AT+VPR=4<enter> is equivalent the Rev 1 modem's AT#BDR=4<enter> to set the DTE speed to 9600 and disable auto-mode.

3. The S23 register sets the serial (DTE) parameters

Rev 1 modem: The S23 General bit mapped register could optional be used to set the serial port parameters (baud rate, parity, and stop bits) the Rev 1 modem. The more common way, however, is to set the serial (DTE) parameters using AT<enter> or AT&W0<enter>. With the AT (attention) commands the modem will automatically detect the baud rate, data bits, parity and stop bits. When just AT<enter> is sent the modem will use the detected parameters until power is cycled or until another AT<enter> or AT&W0<enter> is sent at different parameters. When AT&W0<enter> is sent the modem will use the detected parameter until another AT<enter> or AT&W0<enter> is sent at different parameters, and will save these even after a power cycle.

Rev 2 and Rev 3 modem: The Rev 2 and Rev 3 modems do not support the S23 register. The serial port parameters are always set by sending AT<enter> or AT&W0<enter> (See Rev 1 modem above).

If your current AT command string has S23 in it for the purpose of setting the serial port parameters simply take it out and add an &W0 on the end of the string, if necessary.

4. The &Zn=# command to store a telephone number in the modems flash memory

Rev 1 and 2 modems: This command is used by all modems to store up to four telephone numbers in flash memory. Each telephone number dial string can contain up to 34 digits, but the wizard allows only 32 digits. The telephone number dial string can be recalled using the S=n dial modifier (ATDS=0 uses stored number 0 for the number to dial with). This number is used by the Industrial Modem Wizard in the Modem Parameter window and the Self-Dialing Parameters window for the Self-Dialing.

AutomationDirect.com Modem Wizard

Self-Dial Parameters
Select the appropriate Self-Dial parameters for your modem

PLC Self-Dialing Modem, Rev 3

Enable Self-Dial Tran

First Phone #: 5554444

Second Phone #: 5551234

First Number Only

AutomationDirect.com Modem Wizard

Modem Parameters
Please specify the required modem parameters.

PLC Self-Dialing Modem, Re

Basic Modem Parameters:

Phone Number 1: 5554444

Ignore DTR (assume DN)

Rev 3 modem: Is implemented the same way as the Rev 1 and 2 modems with the exception of the number of characters allowed in the telephone number string. Each telephone number dial string can contain up to 31 digits as opposed to 34 digits in the Rev 1 and Rev 2. This may cause a problem particularly in Self-Dialing applications where the Self-Dialing is configured to send a string to a beeper. To get around this you can increase the time of the commas used in your AT command string using the S8 register (the default value is 2 sec.). For example, the string entered in the Self-Dialing Parameters window may be '5554444,,1,,,911', where the commas indicate the pauses necessary to wait for the operator prompt in your paging service. If you change the S8 register to 4 sec. (ATS8=4), then you can cut the amount of commas in half (5554444,1,,911) decreasing the amount characters necessary in your string.

Service can be facilitated through our office at:

AutomationDirect.com
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Phone: (770) 889-2858

Appendix A

Using the Industrial Modem Wizard instead of an init string:

The Industrial Modem Wizard is specifically designed to save the most essential AT commands into the modems flash memory. The modem will configure itself according to whatever is configured in this reliable method of storage after a power cycle or soft reset (ATZ0<enter>). When the modem has been configured through the Industrial Modem Wizard there is no need to repeatedly send AT commands via an initialization string in a PLC or controller. In other words when the modem is set through the wizard the configuration is permanently stored.

Benefits of using the Industrial Modem Wizard:

- **Easy standardization.** The Industrial Modem Wizard allows the user to save a configuration file (*.6ms) for easy integration and standardization of the configuration process.
- **The Industrial Modem Wizard is easy to use.** Intuitive wizard format and well-labeled features makes it easy for anyone to select the essential AT commands that affect modem communication.
- **Easy AT command customization.** If the Industrial Modem Wizard does not include an AT command that you need to use there is an easy-to-use text box that allows any string to be sent and saved into the modem's rugged flash memory.
- **Excellent help files.** Industrial Modem Wizard help is accessible from any wizard window and shows the equivalent AT commands for every feature in Industrial Modem Wizard. This will help the user convert any initialization sting into a Modem Wizard configuration file (*.6ms).

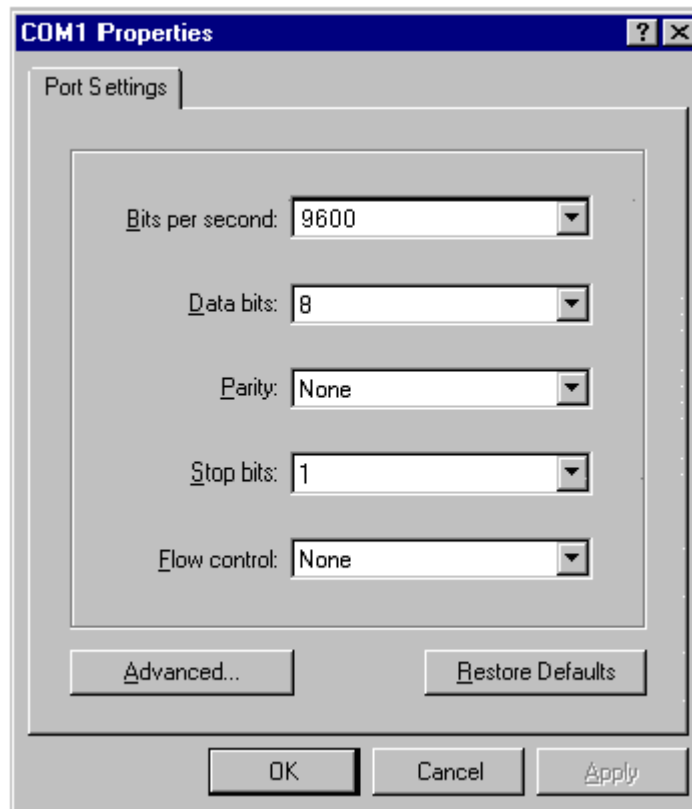
Appendix B

Using HyperTerminal to send AT commands to the modem:

Windows HyperTerminal steps

Step 1: Connect your Industrial Modem to your computer using the straight-thru cable. Open Windows HyperTerminal. (*This program is included with all Windows versions. Refer to the Self-Dialing user manual for more details.*) Enter a name for your connection.

Step 2: Under “Connect Using” select **Direct to Com “X”**, where “X” is the COM port the modem is connected to. Another window will appear. Enter the following settings, where **Bits per second** is the desired PLC baud rate, then press OK:



Choose the baud rate that matches the PLC or other device that will be connected to the modem. Anytime a setting is saved using &W0 or &W1, the RS232 baud rate is memorized by the VT-Modem. The saved baud rate will be used for future communications with any attached device that does not initiate communications with the modem (such as most PLCs).

Step 3: You should be at a blank screen. Test that you are connected by typing **at <enter>**. The modem should respond with an **OK** if you are connected. Now enter these commands. (Press **<enter>** after each.)

- To dial a number in HyperTerminal, you can use the command: **atdt<number>**. When you have successfully connected to another modem, it will show the baud rate at which you are connected. **Example: atdt15188778346**
- To check whether your Industrial Modem is communicating, look at the “TD” and “RD” LED's on the modem. They will light up when communicating.
- To Hang-up the connection Open the HyperTerminal session saved from the previous steps. Type **+++**, you should get an **OK** back, then type **ath <enter>**. The resulting **OK** indicates that the modem-to-modem connection is terminated.
- If you are using a terminal program other than HyperTerminal, the steps may be different. However, the commands will remain the same.