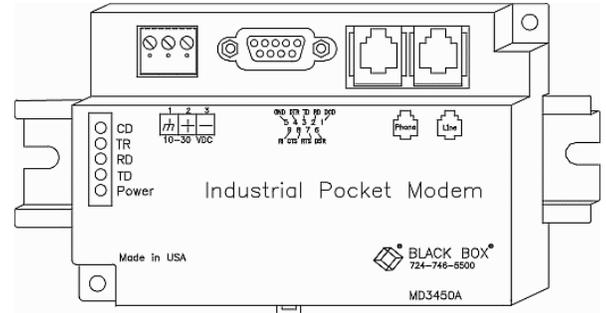




Black Box Corporation
The World's Source for ConnectivitySM

User Manual

GENERAL PURPOSE SELF-DIALING RS-485/RS-422 Industrial Pocket Modems



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Class 1, Division 2,
Groups A, B, C, and D
Hazardous Locations

INSTALLATION AND HAZARDOUS AREA WARNINGS

These products should not be used to replace proper safety interlocking. No software-based device (or any other solid state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety.

In particular, the manufacturer disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

All power and input / output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods and in accordance with the authority having jurisdiction.

WARNING-EXPLOSION HAZARD-SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.

WARNING-EXPLOSION HAZARD-WHEN IN HAZARDOUS LOCATIONS, DISCONNECT THE POWER BEFORE REPLACING OR WIRING MODULES.

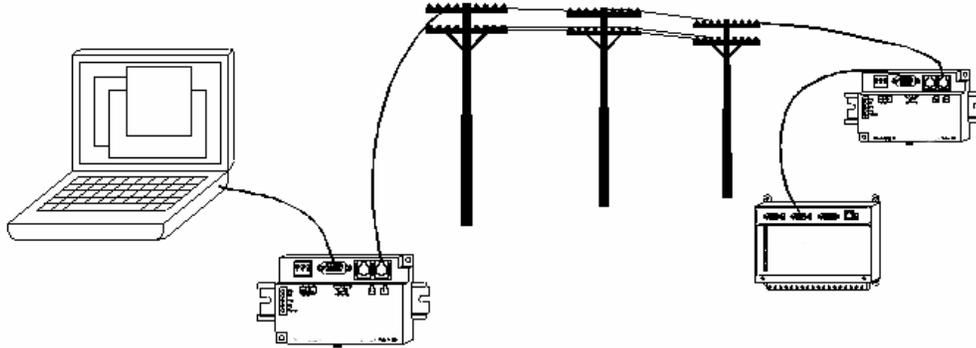
WARNING-EXPLOSION HAZARD-DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

The information in this manual applies to the following Black Box Industrial Pocket Modems:	
MD3450A	General Purpose Modem
MD3451A	Self-Dialing Modem
MD3452A	RS-485/RS-422 Modem

Section 1 Overview

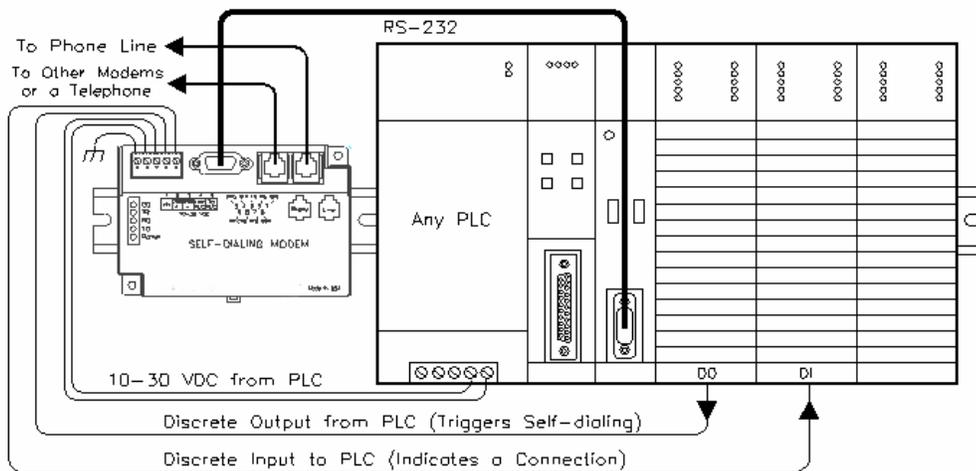
These rugged Industrial Pocket Modems have been designed for operation in electrical enclosures installed in harsh environments. All Industrial Pocket Modems support all standard Hayes AT commands, Fax Class 1 and Class 2 commands and S-registers, and therefore can be set-up as external modems on any PC. Industrial Pocket Modems are compatible with any telecommunications or dial-up networking software.

Industrial Pocket Modems allow easy access to PLCs, RTUs, I/O equipment, industrial computers, remote weather stations, pagers, and many other devices via standard analog PSTN-provided dial-up telephone connections. The modem may be DIN-rail or panel mounted adjacent to other components, inside of new or existing enclosures. Most Windows software can communicate through an Industrial Pocket Modem, to perform file transfers, diagnostics, program debugging and many other operations.



All Industrial Pocket Modems allow communication to remote sites for data retrieval or diagnostics.

Note: All Industrial Pocket Modems communicate over analog phone lines only.



The Self-Dialing Pocket Modem (MD3451A) has all the features of the General Purpose Pocket Modem (MD3450A), plus the ability to dial out based on an alarm contact closure or PLC discrete output.

Identifying the modem you have

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

1. The Industrial Modem Wizard will 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 on 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.
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. To query the firmware version enter the **ati3<enter>**. Please see the tables below for information on how to interpret this firmware rev number.

General Purpose

Modem Wizard	Rev 1	Rev 2	Rev 3
Back Label	1.00-1.08, 1.10-2.02	1.09	3.00 and above
HyperTerminal (ati3)	V2.100-V34_2M_DLS	P2109-V90	CX81802-V34

Self-Dialing

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

RS-485/RS-422

Modem Wizard	Rev 1	Rev 2	Rev 3
Back Label	1.00-1.02, 1.04-1.06	1.02/1.03	2.00
HyperTerminal (ati3)	V2.100-V34_2M_DLS	P2109-V90	CX81802-V34

Self-Dialing Industrial Pocket Modem

Self-Dialing action is triggered by a switch closure or PLC output signal. When the self-dial input is energized, the Self-Dialing Pocket Modem dials a pre-stored phone number and optionally identifies itself by way of a pre-stored ASCII message. Flexible features allow this modem to perform retries or even connect to an alternate number until it has verified that a connection has been established. The call will terminate when either:

- The computer completes its polling and hangs up
- The self-dialing discrete input is turned off
- A telephone line problem disrupts the call.

The Self-Dialing feature enables field-installed equipment to establish a telephone link based upon a simple switch closure. This Self-Dialing Pocket Modem adds “dial upon alarm” intelligence to any remote site. This enhanced modem is ideal for:

DIALING UPON ALARM FROM ANY PLC

This modem establishes a connection based upon a coil output from any PLC. Once a connection has been established, the PLC’s system (programming) port is connected to the computer at the other end of the phone link and may be polled by that computer as if the computer had initiated the call. When the modem connects to the central computer, it identifies itself so the computer can run the appropriate I/O driver and interrogate the PLC.

SENDING A MESSAGE BASED UPON A SWITCH CONTACT

Locations that do not have PLCs (or other intelligence) can originate calls to alert you to low tank levels, over temperature conditions, or other alarms. Simply connect the appropriate alarm contact to the modem’s input. The modem will dial the pre-stored phone number and deliver a stored ID message to the computer at the receiving end.

Industrial Pocket Modem RS-485/RS-422

The RS-485/RS-422 Industrial Pocket Modem (MD3452A) has a RS485/RS422 port that can function in place of its RS232 port. The RS485/RS422 port supports RS422 and RS485 full-duplex, and two wire RS485 half-duplex communication to compatible devices. The RS-485/RS-422 Pocket Modem is user-configurable to communicate through either the RS232 port (General Purpose mode) or through the RS485/RS422 port. Only one port may be used at a time.

SETUP WIZARD

A modem setup utility is provided on the Industrial Pocket Modem CD to help you quickly configure any modem. In most applications, no knowledge of modem AT commands or S register contents is necessary. Pre-configured profiles, for common situations, are provided for your convenience.

Section 2 Performance Specifications

Telephone Port (all models)	
Max. Data Rate	33.6 kbps (V.34)
Compatibility	V.34, V.32bis, V.32, V.22bis, V.22A/B, V.23, V.21, Bell212A & 103
Data Compression	V.44/V.42bis/MNP 5
Error Correction	V.42/MNP 2-4
Max Fax Modem Rate	14.4 kbps (V.33)
Fax Modem Compatibility	Group 3 (V.33, V.17, V.29, V.27ter, V.21 ch. 2)
Ringer Equivalent	0.3
Line Jack	RJ11
Phone Jack (except RS485)	RJ11
RS232 Port (all models)	
Max. RS232 Rate	115.2 kbps (Kilobaud)
RS232 Signal Support	TXD, RXD, CTS, RTS, DCD, DTR, DSR, RI, GND
RS232 Connector	DB9 female, RS232
Command Set	All standard AT and S register commands including Class 1, Class 2 Fax commands and Voice commands
RS485/RS422 Port (Industrial RS-485/RS-422 Pocket Modem only)	
RS422 mode	4 wire full duplex
RS485 modes	2 or 4 wire party-line operation (half duplex)
Signal rate	Standard rates up to 115.2 kbps (Kilobaud)
RS485/RS422 distance	Up to 0.5 miles
Status LEDs (all models)	
CD (Carrier detect)	The modem has detected a carrier on the phone line (a remote modem has been detected).
TR (Data Terminal Ready)	The PC (or other device) has established a connection to the modem and is ready.
RD (Receive Data)	Flashes as data is received from the phone line.
TD (Transmit Data)	Flashes as data is sent out the phone line.
Power	On when power is present.
General Characteristics (all models)	
Input Power	10 - 30 VDC (General Purpose, Self-Dialing models), 10 – 52 VDC (RS-485/RS-422 models)
Input Current (Rev 1 and Rev2, see section 1)	65mA @ 24VDC and 26mA in Low Power mode of General Purpose (typical) 97mA @ 24VDC and 64mA in Low Power mode of Self-Dialing (typical) 68mA @ 24VDC and 28mA in Low Power mode of RS-485/RS-422 (typical)
Input Current (Rev 3)	50mA @ 24VDC and 30mA in Low Power mode for General Purpose/Self-Dial (typical) 55mA @ 24VDC and 35mA in Low Power mode for RS-485/RS-422 (typical)
Certification	FCC Part 15 and FCC Part 68; UL 508; CSA C22.2/14; ACA TS 001- 1997; ACA TS 002-1997; AS/NZS3260-1993;AS/NZS3548-1995; CTR21 (98/482/EC); EN55022;R&TTE (99/5/EEC), IEC 950:1991.
Operating Temperature	-30 ° to 70 ° C
Storage Temperature	-40 ° to 85 ° C
Humidity	5 to 95% RH (non-condensing)
Mounting	DIN rail or panel mount
Dimensions	3.23 W x 4.75L x 1.35H inches (8.2 W x 12.1 L x 3.4H cm)
PLC Discrete I/O Interface (Self-Dialing only)	
Trigger Input (From PLC)	Connects to PLC output. Starts auto-dialing upon transition from OFF to ON. Modem will stay connected while input is ON.
Voltage Range	10 to 30 VDC
Input Current	6.5mA at 24 VDC
Max. OFF Voltage	5 VDC
On-line Output (To PLC)	Output is ON as long as a connection exists (carrier detect).
Output Characteristics	Sourcing – switches supply power
Max. Output Current	100mA

Section 3 Modem Mounting

Pocket Modems snap onto standard DIN rail (DIN EN 50022), or can be mounted to a flat panel using #6 or #8 screws. See Figure 3-1. The modem can be installed in any orientation, adjacent to other DIN rail components or in any convenient location within the enclosure. The modem should be installed within 6 feet of the device it will be connected to.

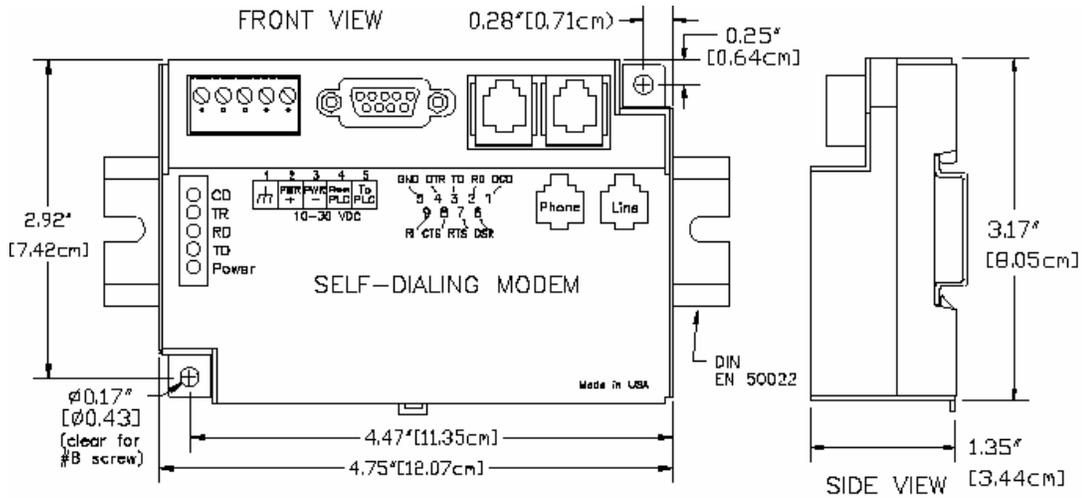


Figure 3-1: Pocket Modem Dimensions, All Models

For DIN rail mounting, hook the top, rear of the modem onto the top edge of the DIN rail. Using a small flat head screwdriver, pull down on the spring-loaded tab on the bottom of the modem and push the modem back against the rail. Reverse these steps to remove the modem. See Figure 3-2 below.

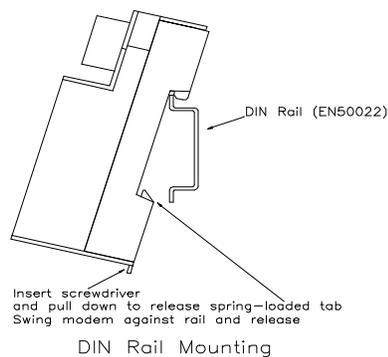


Figure 3-2: DIN Rail Mounting

Section 4 Electrical Connections

RS232 Connections (All Modem Models):

Use a straight-through or equivalent cable to connect the modem's RS232 port (DB9 Male cable end) to the RS232 port on a PC or other "Data Communications Equipment" (DCE) device (DB9 Female cable end). As shown in Figure 4-1, the Pocket Modem wiring is a straight through serial communications cable suitable for connecting a DTE device (PC, PLC or other device) to a DCE device (Industrial Pocket Modem).

Cable requirements for PLCs and other devices may be different. Refer to the PLC or other device's documentation for cable pinouts.

Cable for Configuring Industrial Pocket Modems

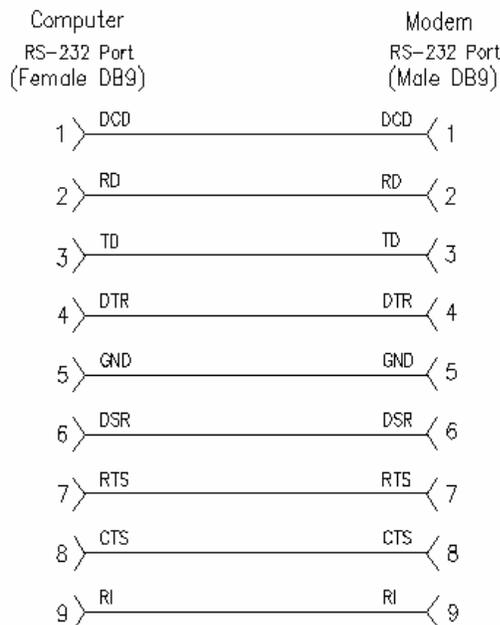


Figure 4-1: Pocket Modem Cable Wiring

General Purpose Pocket Modem Power, Phone Line Connections:

DC Power Wiring

Connect 10 - 30 VDC to the General Purpose Pocket Modem as shown in Figure 4-2. The modem can usually be powered from the same DC source as other devices in the enclosure. All the screw terminals should be tightened to a maximum of 3.48 in-lbs.

Telephone Cable

Connect analog phone lines to the RJ-11 jacks as appropriate. One RJ-11 jack is provided to connect directly to a telephone (optional) and the second RJ-11 jack functions as the connection to the telephone network.

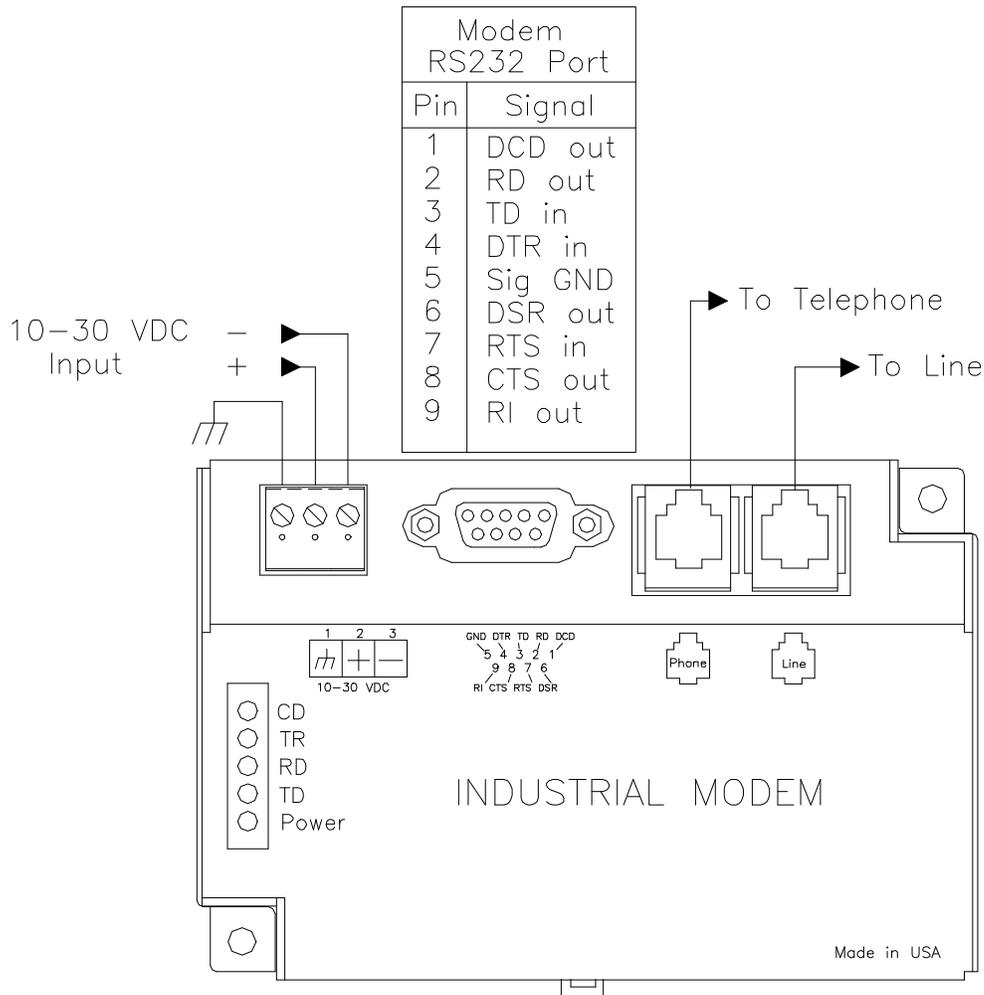


Figure 4-2: General Purpose Pocket Modem Wiring

Self-Dialing Pocket Modem: Power, Phone Line, I/O connections

DC Power Wiring

Connect 10 - 30 VDC to the Self-Dialing Pocket Modem as shown in Figure 4-3. The modem can usually be powered from the same source as other devices in the enclosure. All the screw terminals should be tightened to a maximum of 3.48 in-lbs.

Telephone Cable

Connect analog phone lines to the RJ11 jacks as appropriate. One RJ-11 jack is provided to connect directly to a telephone (optional) and the second RJ-11 jack functions as the connection to the telephone network.

PLC Self-Dial I/O Connections

Connect a 10-30VDC signal to the 'From PLC' (trigger input) terminal. An OFF to ON transition of this signal starts the auto-dialing sequence. The modem will dial and remain connected while the signal is ON. When the signal goes false, the modem will terminate the connection or the call in progress.

The 'To PLC' (on-line output) terminal will go ON (ON = user supplied VDC input) when a modem-to-modem connection has been established and the proper 'Acknowledge Message' has been received.

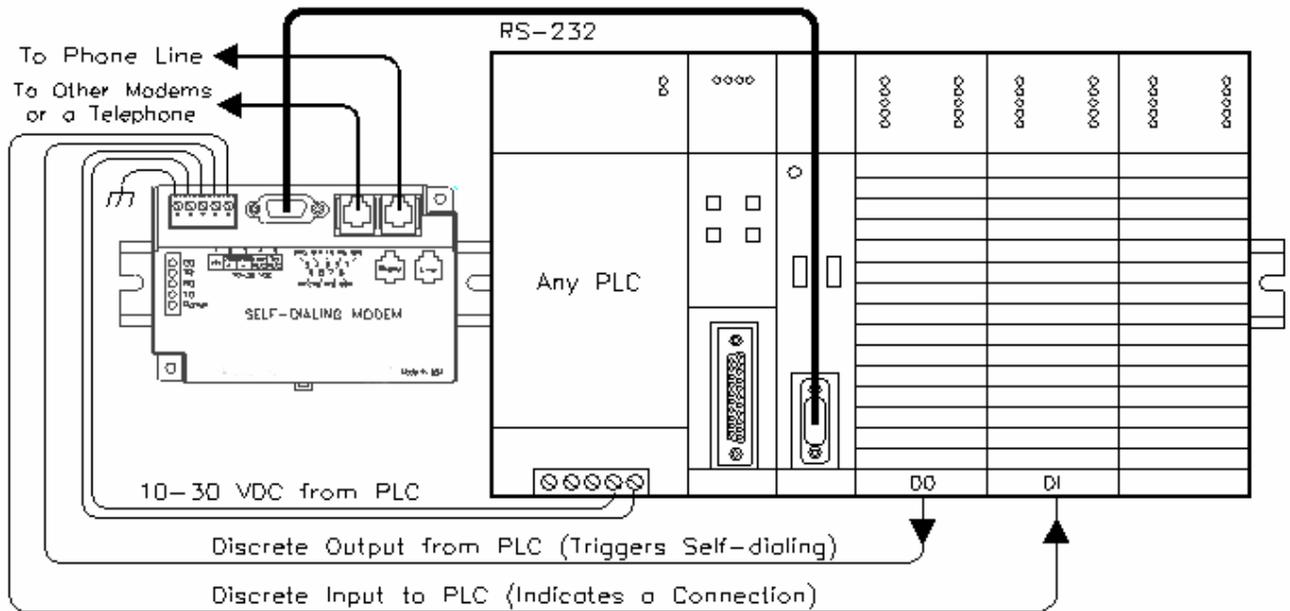


Figure 4-3: Self-Dialing Pocket Modem Wiring

Pocket Modem RS-485/RS-422: Power, Phone Line, RS485/RS422 Connections

DC Power Wiring

Connect 10 - 52 VDC to the RS-485/RS-422 Pocket Modem as shown in Figure 4-4. The modem can usually be powered from the same source as other devices in the enclosure. All the screw terminals should be tightened to a maximum of 3.48 in-lbs.

Telephone Cable

Connect an analog phone line to the RJ-11 jack as appropriate.

RS485/RS422 Cabling and DIP Switch Settings

Refer to Figure 4-4 for typical wiring configurations. Fabricate a cable to connect the modem's RS485/RS422 port to the field device(s). Refer to figure 4-5 on the next page.

The RS-485/RS-422 Pocket Modem has DIP switches. These switches establish the mode of operation for the RS485/RS422 port. Set these switches to match the type of wiring connected to the RS485/RS422 port. Refer to Figure 4-5 on the next page. It is not necessary to cycle power to the modem if DIP switch changes are made.

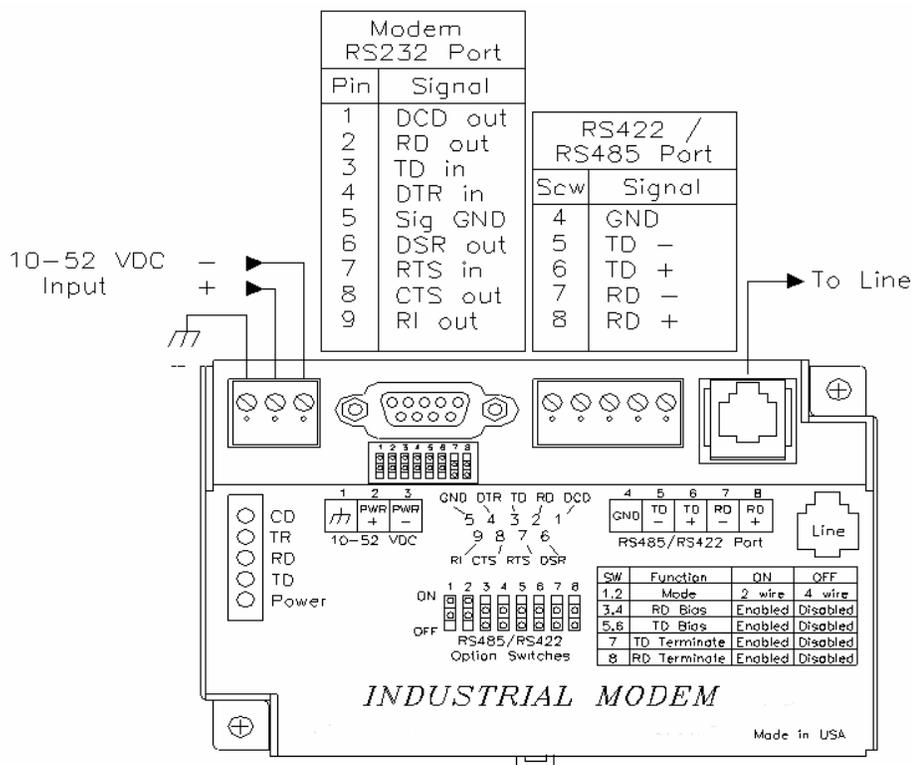
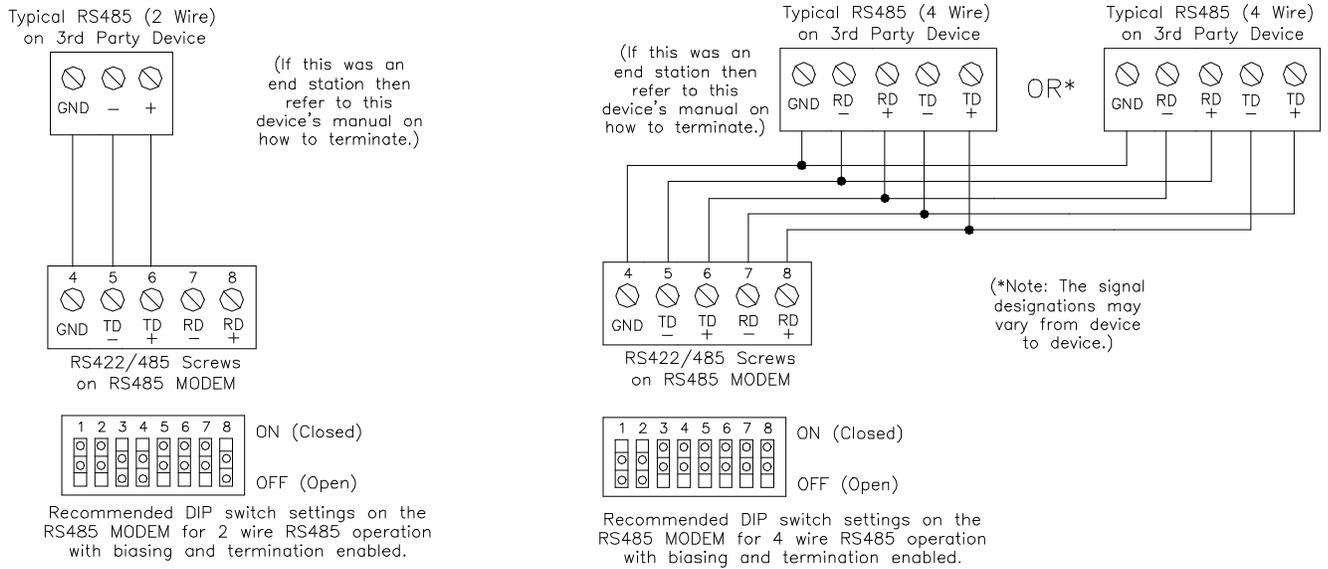
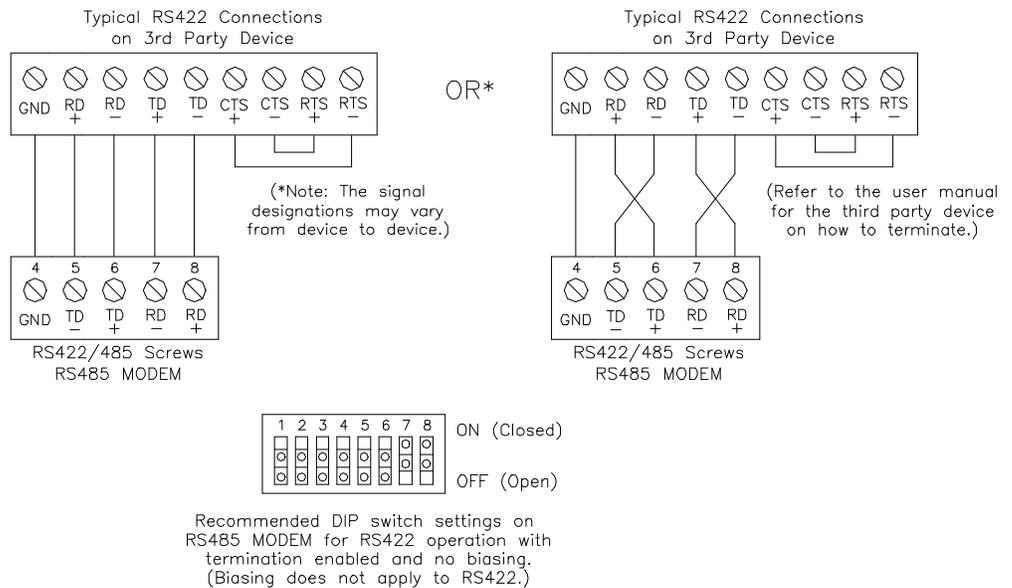


Figure 4-4: Pocket Modem RS-485/RS-422 Wiring



Typical 2 Wire RS485
Multidrop Wiring

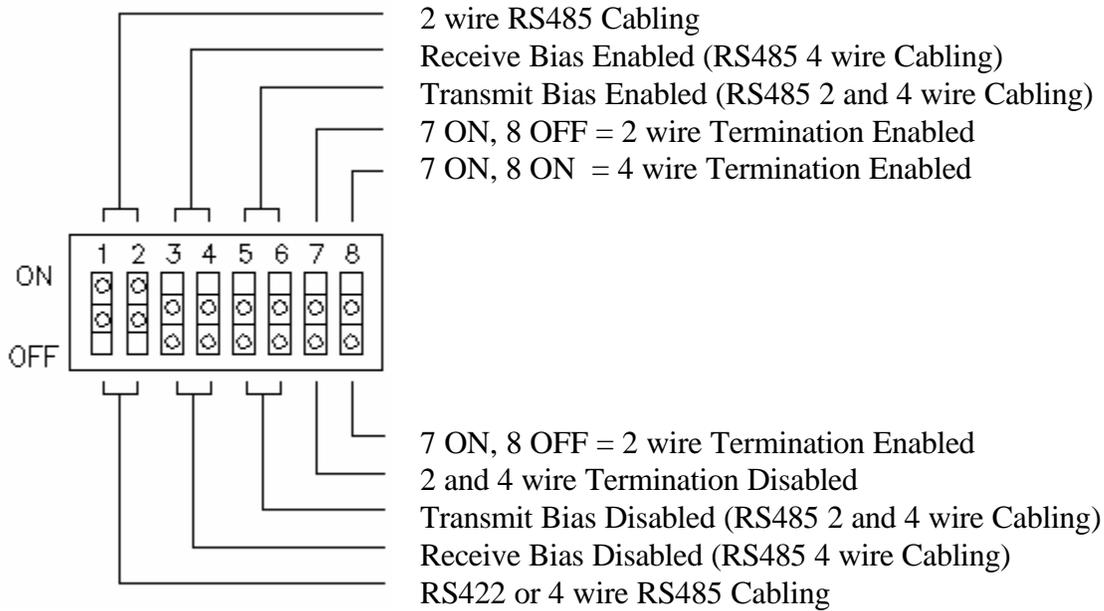
Typical 4 Wire RS485
Multidrop Wiring



Typical RS422
On-on-One Wiring

Figure 4-5: Detailed RS-485/RS-422 Pocket Modem Wiring and DIP Switch Settings

RS485/422 DIP Switch Summary



RS485/RS422 Network Termination

The RS-485/RS-422 Pocket Modem has built-in termination components for the Receive Data and Transmit Data signals. Termination of these signals is enabled by setting DIP switches on the RS485/422. Termination components are often built into other RS485/RS422 devices, and are typically enabled by setting a jumper or DIP switch on the appropriate device.

Here are some guidelines for the use of termination:

- Terminations should be enabled at both ends of an RS422 communication cable.
- Terminations should be enabled at both end stations on an RS485 network. No more than two stations should be terminated on an RS485 network.

Bias Resistors (RS485 networks only)

On an RS485 two wire network there should be one pair of bias resistors acting upon the transmit/receive wires. On an RS485 four wire network there should be two pairs of bias resistors; one pair on the receive wires and one pair on the transmit wires. Bias resistors force the receive or transmit/receive wires to a known (non-floating) state when none of the RS485 devices are transmitting data. If bias resistors are not present, some RS485 devices may experience communication errors due to noise on the floating wires.

The location of the bias resistors is not critical. Typically they are installed at the master RS485 device. Bias resistors are provided in the RS-485/RS-422 Pocket Modem and are enabled through DIP switch settings (Refer to figure 4-6). There should be only one pair of these resistors connected to an RS485 two wire network, and only two pairs of these resistors connected to an RS485 four wire network. Refer to Figure 4-5 for recommended RS485/422 DIP switch settings. Do not enable the RS485/422 bias resistors if there are bias resistors enabled on one of the other RS485 devices.

Bias resistors do not apply to RS422 wiring because the wires are always driven by the two RS422 devices. The wires are not permitted to float.

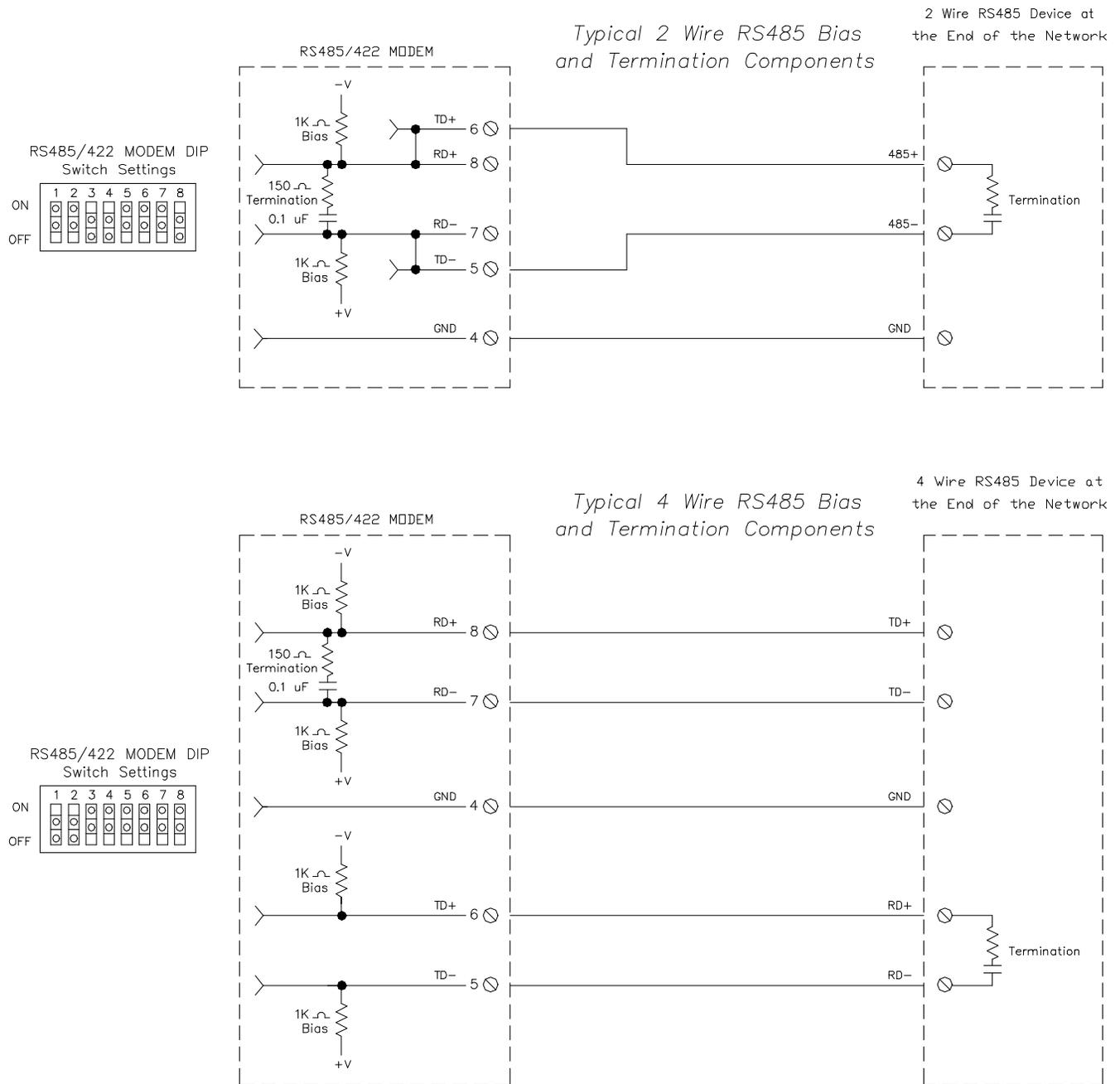


Figure 4-6: Typical RS485 Network Bias and Termination

Configuring a PC Modem to Communicate with a Pocket Modem RS-485/RS-422 in RS422 or RS485 Mode:

It may be necessary to change your PC's modem settings when communicating with a RS485/422 Pocket Modem running in RS422 or RS485 mode. Here are the recommended settings:

- The PC modem, RS-485/RS-422 and the modem-to-modem speed should be set to the same rate.

Section 5 Modem Configuration

Configuration as an External Modem on a PC:

Any Industrial Pocket Modem can be connected directly to a PC. The modem will need to be “installed” in Windows prior to use. Here are instructions on how to install the modem in both Windows 95, 98 and Windows NT.

Pocket Modem Installation in Windows 95/98

Plug and Play method (recommended):

- 1) With the PC off, connect DC power and the telephone line to the modem. Connect a communications cable (STRAIGHT-THROUGH or equivalent) between the modem and the PC. Turn on the PC. During the boot-up process, Windows should detect the modem and display the New Hardware Found dialog box.
- 2) Make the selection “Select from a list of alternative drivers”.
- 3) The Select Device dialog will be displayed. In the column labeled Manufacturers, select “Standard Modem Types”. In the column labeled Models, select “Standard 28800 bps Modem”. Click OK. Windows will then complete the boot-up process. (The standard Windows driver is used for the Industrial Pocket Modem. Although the modem supports baud rates to 33,600 bps, the selections in Windows are limited to 28800 bps.)
- 4) To verify that the modem has been installed, select Start → Settings → Control Panel, and then double click the Modems icon. The modem should be listed as “Standard 28800 bps Modem”.

Here is an alternate modem installation procedure (use if the PC is already powered up):

- 1) Connect the DC power, communications cable (STRAIGHT-THROUGH or equivalent) and telephone line as described above.
- 2) Select Start → Settings → Control Panel, and then double click the Modems icon.
- 3) The Install New Modem dialog box will appear. Do not select the “Don’t detect my modem, I will select it from a list”. Instead, click Next and allow Windows to search the COM ports and detect the modem.
- 4) Windows should find a modem called Standard Modem. Click Next and Windows will complete installation of the Standard Modem. (Alternately, click Change and select “Standard Modem Types” from the Manufacturers list, and “Standard 28800 bps Modem” from the Models list.)
- 5) To verify that the modem has been installed, select Start → Settings → Control Panel, and then double click the Modems icon. The modem should be listed as either a “Standard Modem” or a “Standard 28800 bps Modem” depending on the steps followed above.
- 6) Upon re-booting the machine, Windows may still find the modem as new hardware. If this happens, select “Do not install a driver (Windows will not prompt again)”.

Modem Installation in Windows NT

- 1) Select Start → Settings → Control Panel, and then double click the Modems icon.
- 2) The Install New Modem dialog box will appear. Do not select the “Don’t detect my modem, I will select it from a list”. Instead, click Next and allow Windows to search the COM ports and detect the modem.
- 3) Windows should find a modem called Standard Modem. Click Next and Windows will complete installation of the Standard Modem. (Alternately, click Change and select “Standard Modem Types” from the Manufacturers list, and “Standard 28800 bps Modem” from the Models list.)
- 4) To verify that the modem has been installed, select Start → Settings → Control Panel, and then double click the Modems icon. The modem should be listed as either a “Standard Modem” or a “Standard 28800 bps Modem” depending on the steps followed above.

Modem Installation in Windows XP

- 1) Select Start → Settings → Control Panel, and then double-click the Phone and Modems Options icon.
- 2) Go to the Modems tab and click the Add button to install a new modem. The Install New Modem wizard will appear. Select the “Don’t detect my modem, I will select it from a list”.
- 3) Highlight the manufacturers list “Standard Modem Types”. From the models list select “Standard 28800 bps Modem”, then click Next.
- 4) Select the COM Port on your computer the modem will be connected to.
- 5) To verify that the modem has been installed, select Start → Settings → Control Panel, and then double click the Phone and Modem Options icon. Go to the Modems tab. The modem should be listed as a “Standard 28800 bps Modem” connected to COM port you selected.

Once the Industrial Modem has been added to your Windows 95, 98, NT or XP system, it is ready for use.

If you are using a PLC or other device, refer to the documentation for that device as necessary.

To Remove a Modem

If it ever becomes necessary to re-install the modem for any reason, select Start → Settings → Control Panel, and then double click the System icon. Next, click the Device Manager tab. The list should display a Modems icon. Double click the Modems icon. Highlight the modem to be removed and then click the Remove button. To reinstall the modem, follow the installation steps as previously described.

Configuring Using the Setup Wizard:

It is highly recommended that the Setup Wizard be used for modem configuration. Simply check the appropriate boxes, choose the appropriate communication settings from the drop down lists, and load the configuration into the modem. This utility does not require user knowledge of AT commands and S-registers.

Refer to the online help system in the Setup Wizard for instructions and application notes.

Note:

The Setup Wizard must be used to configure the parameters of the Self-Dialing Pocket Modem and the RS485/RS422 port parameters of the RS-485/RS-422 Pocket Modem.

Blackbox Modem Wizard

Modem Parameters
Please specify the required modem parameters.

PLC Self-Dialing Modem, Rev 3, Firmware V1.06

Basic Modem Parameters:

Phone Number 1:

Enable Auto-Answer on Rings

Ignore DTR (assume ON) Ignore Carrier Detect (force ON)

Advanced Modem Parameters:

Disable Command Echo Disable Error Correction

Flow Control: Disable Data Compression

Save Power After Seconds

Modem to Modem Speed:

Fixed Speed: Auto detect Speed to:

User-Defined "AT" String:

Restore Factory Modem Defaults

< Back Next > Cancel Help

Setting the Modem's Serial Port Baud Rate for the PLC

The modem has an automatic baud rate detection feature that lets the modem recognize commands through its serial port at any supported baud rate. However, if the modem is connected to a device that does not send commands or data unless spoken to (such as most PLCs), then the modem will pass information from the phone line to its serial port at the last auto-detected baud rate. This is typically the baud rate used by the Setup Wizard when configuring the modem.

The modem is defaulted at the factory for 9600-baud. To change this setting, connect the modem to a PC. Start the Setup Wizard and choose the baud rate that matches the PLC's baud rate. Then choose the appropriate settings and write the configuration to the modem. Exit the Setup Wizard and reconnect the modem to the PLC. (Be sure to cycle power to the modem.) Call the modem and verify that the PLC is responding to commands.

Limiting the Phone Line Connection Speed for Reliability

Typically, when a modem-to-modem connection is established, the two modems negotiate and connect at the fastest possible phone line speed that is within the capability of both modems. The quality of the phone line connection (during the negotiation) will be taken into account. If both modems are of a modern design, the phone line speed can be 33.6K bits per second (or higher, using data compression). Note that this phone line speed is independent of the DTE (serial port) speed, though some older modems require that the phone line speed and DTE speed be the same.

In practice the quality of any phone line changes continually, and frequent data errors may occur. The probability of errors usually increases as the phone line speed increases. Therefore, it is often desirable to restrict the phone line speed to a rate that will provide good performance and yield reliable data. It is also commonplace to restrict the phone line speed to maintain compatibility when replacing an older modem with an Industrial Pocket Modem.

By default, the modem will permit any data transfer rate up to 115.2 kbps when data compression is enabled. If you experience intermittent or unreliable communication, try setting the modem-to-modem speed (in the Setup Wizard) to a lower value, to restrict the phone line speed. (Remember to load the new configuration to the modem.)

Industrial Pocket Modem Profile Summary

Here is a summary of the active configuration, user profile 0, user profile 1 and the factory defaults when the modem is shipped.

Each time the modem is powered up; first the factory default settings (as listed in Section 6) are loaded into the active configuration. Next, the designated user stored profile is loaded into the active configuration. User profile 0 is loaded by default (see the &Y command in Section 6) and it contains all factory defaults with the exception that it is set to auto answer (register S0=1), and ignore the DTR signal (&D0).

The User profile 1 contains all normal factory defaults (as listed in Section 6).

ACTIVE PROFILE:

```
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D0 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 &Y0
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:050 S08:002 S09:006
S10:014 S11:085 S12:050 S18:000 S25:005 S26:001 S36:007 S38:020 S46:138 S48:007
S95:000
```

STORED PROFILE 0:

```
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D0 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0
S00:001 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:085 S12:050 S18:000
S36:007 S40:104 S41:195 S46:138 S95:000
```

STORED PROFILE 1:

```
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0
S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:085 S12:050 S18:000
```

FACTORY DEFAULTS:

```
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 &Y0
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:050 S08:002 S09:006
S10:014 S11:085 S12:050 S18:000 S25:005 S26:001 S36:007 S38:020 S46:138 S48:007
S95:000
```

Section 6 AT Command Summary

All Pocket Modem models support the AT, Fax Class 1 and Class 2 commands listed in this Section. The modem contains a set of factory default settings, which can always be restored by the user. (See the &F command.) The modem also provides two user profiles (profile 0 and profile 1) which hold settings as set and saved by the user. (See the &W command.) The settings currently in use by the modem are generally referred to as the active configuration.

Notes:

Self-Dialing Pocket Modem parameters and RS-485/RS-422 Pocket Modem port parameters can only be set using the Setup Wizard, which is provided. Refer to the on-line help in the Setup Wizard for more information.

The following tables only summarize the supported AT commands. The valid parameters and default settings for each AT command are documented in the online help system of the Setup Wizard.

Commands marked with an asterisk (*) have different characteristics, depending on the revision of POCKET MODEM being used. Refer to the online help system of the Modem Setup Wizard for the details of these differences.

Command	Function
A/	Re-execute Last Command; do not precede with AT command and do not follow with a carriage return.
A	Go off hook and Answer A Call
AT=x	Write value x to last selected register.
AT?	Report the value of last selected register.
Bn	Set data standard to CCITT(Europe et. al.) or Bell Mode(U.S., Canada) for connections at 300 or 1200 bps.
Cn	Carrier Control (parameter = 1 only)
Dn	Dial (originate a call); typical usage: ATDT5551212 to tone dial number. ATDS=n to dial nth stored number.
E	Echo command to monitor when typed
Fn	Not available.
Hn	Disconnect (Hang up)
In	Identification; reports product code, name, ROM and firmware data, etc.
Ln	Speaker Volume (not available)
Mn	Speaker Control (not available)
* Nn	Automode Enable; enabled allows connection at highest possible modem speed, disabled fixes speed according to register S37.
On	Return To On-line Data Mode
P	Set Pulse Dial Default.
Qn	Quiet Results Codes Control; when enabled, result codes are reported to the monitor.
Sn	Establishes S Register n as the last register accessed
Sn-x	Write value x to S Register n.
Sn?	Reports the value of S Register n.

T	Set Tone Dial Default
Vn	Set Result Code Format to terse or verbose.
Wn	Connect Message Control sets the format of the connect messages.
Xn	Extended results code
Yn	Long space disconnect
Zn	Perform Soft Reset and Restore stored user configuration profile 0 or 1.
&Cn	RLSD (DCD) Option; set DCD signal to indicate presence of carrier or forces DCD signal on at all times.
&Dn	DTR Option; set how modem interprets the DTR signal.
&Fn	Restore factory configuration profile 0 or 1.
&Gn	Select guard tone
&Jn	Telephone jack control
&Kn	Set Flow Control
* &Mn	Asynchronous/synchronous mode selection
&Pn	Select pulse dial make/break ratio
* &Qn	Asynchronous/synchronous mode selection
&Rn	RTS/CTS option sets how the modem controls the CTS signal
&Sn	DSR Override sets how the modem controls the DSR signal
&Tn	Test & diagnostic settings
&V	Display current configuration, stored user profiles and stored telephone numbers
&V1	Display last connection statistics
&Wn	Store current active configuration in one of the two user profiles
&Xn	Select synchronous clock source
&Yn	Designate a default-reset profile. This profile will be active after a hard reset
* &Zn=x	Store phone number; n = 0 to 3 and x = dial string
%E	Enable/disable line quality monitor and autoretrain or fallback/fail forward
%L	Report line signal level
%Q	Report line signal quality
%7	Plug and Play Serial Number
%8	Plug & Play Vendor ID, Prod. No.
\Kn	Break Control sets how the modem responds to a break signal
\Nn	Sets the Operating Mode of the modem: direct, normal, reliable or auto reliable
\Vn	Single Line Connect Message Enable
\An	Select Max MNP Block Size
\Bn	Transmit Break to Remote sets the length of break signal sent to remote modem(in non error correction mode)
* +MS	Select Modulation allows control of the modulation the modem uses to negotiate a connection
* +VDR	Enable/disable distinctive ring
* +GCI	Country Select
* +A8E	V.8 and V.8bis Operation Controls
%Cn	Enable/Disable Data Compression (MNP5, V42bis or both)
)Mn	Enable Cellular Power Level Adjust (only included for compatibility and

	performs no function)
@Mn	Initial Cellular Power Level Setting (only included for compatibility and performs no function)
:E	Compromise Equalizer Enable (only included for compatibility and performs no function)
*B	Display Blacklisted Numbers
*D	Display Delayed Numbers
-Kn	MNP Extended Services
#UD	Last Call Status Report
Voice Commands:	
A	Answering in Voice/Audio Mode.
D	Dial command in Voice/Audio Mode.
H	Hang up in Voice/Audio Mode.
Z	Reset from Voice/Audio Mode.
* #BDR	Select baud rate (turn off autobaud). Enable/Disable RPI and DTE Speed
#CID	Enable Caller ID detection and select reporting format.
#CLS	Select data, fax, or voice/audio.
#MDL?	Identify model.
#MFR?	Identify manufacturer.
#REV?	Identify revision level.
#TL	Audio output transmit level.
#VBQ?	Query buffer size.
#VBS	Bits per sample (ADPCM or PCM).
#VBT	Beep tone timer.
#VCI?	Identify compression method (ADPCM).
#VLS	Voice line select (ADPCM or PCM).
#VRA	Ringback goes away timer (originate).
#VRN	Ringback never came timer (originate).
#VRX	Voice Receive Mode (ADPCM or PCM).
#VSD	Enable silence deletion (voice receive, ADPCM).
#VSK	Buffer skid setting.
#VSP	Silence detection period (voice receive, ADPCM).
#VSR	Sampling rate selection (ADPCM or PCM).
#VSS	Silence detection tuner (voice receive, ADPCM).
#VTD	DTMF tone reporting capability.
#VTM	Enable timing mark placement.
#VTS	Generate tone signals.
#VTX	Voice transmit mode (ADPCM or PCM).

* Caller ID:	
+VCID	Enabling and configuring parameters of Caller ID detection.
Synchronous Access Mode:	
* +ES	Enable/Disable Synchronous Access Mode in the client or central site modem
+ESA	Configures the Operation of the Synchronous Access Submode
+ITF	Selects Transmit Flow Control Thresholds
Fax Commands:	
+FCLASS	Select Active Service Class
+FAA	Auto answer enable
+FAE	Auto answer enable
+FTS	Stop transmission and pause
+FRS	Wait for silence
+FTM	Transmit data with <mod> carrier
+FRM	Receive data with <mod> carrier
+FTH	Transmit HDLC data with <mod> carrier
+FRH	Receive HDLC data with <mod> carrier
+FAR	Adaptive reception control
+FCL	Carrier loss timeout
+FDD	Double escape character replacement control
+FIT	DTE inactivity timeout
+FPR	Fixed DTE Rate
+FMI?	Report manufacturer ID
+FMM?	Report model ID
+FMR?	Report revision ID
+FLO	Flow Control

Section 7 S Register Summary

Note:

The following tables only summarize the supported S-registers. A more detailed description for each S-register may be found in the online help system of the Setup Wizard.

Register	Function	Range	Units	Default
S0	Number of rings required before modem auto answers	0-255	rings	0
S1	Ring counter increments each time a ring is detected	0-255	rings	0
S2	Escape character	0-255	ASCII	43
S3	Carriage return character	0-127	ASCII	13
S4	Line feed character	0-127	ASCII	10
S5	Backspace character	0-255	ASCII	8
S6	Maximum time to wait after going off-hook to dial when blind dialing	2-255	sec	2
S7	Maximum time to wait for carrier after dialing before hanging up	1-255	sec	50
S8	Pause time for dial delay modifier	0-255	sec	2
S9	Carrier detect response time; duration that carrier must be present for modem to consider it a valid connection	1-255	0.1s	6
S10	Carrier loss disconnect time; carrier must be absent for this time for modem to consider it a lost connection	1-255	0.1s	14
S11	DTMF tone duration	50-255	0.001s	95
S12	Escape prompt delay; this delay must be present after receipt of the last character of the escape sequence(before receipt of any other character) for the escape sequence to be recognized	0-255	0.02s	50
S13	Reserved	-	-	-
S14	General bit mapped options indicates the status of the following options: echo, quiet mode, results codes, tone/pulse and originate/answer	-	-	138(8Ah)
S15	Reserved	-	-	-
S16	Test mode bit mapped options (&T)	-	-	0
S17	Reserved	-	-	-
S20	AutoSync HDLC Addr or BSC Sync Char	0-255	-	0
S21	V24/general bit mapped options indicates the status of the following options: CTS(&Rn), DTR(&Dn), DCD(&Cn), DSR(&Sn), long space disconnect(Yn)	-	-	52(34h)
S22	Speaker/results bit mapped options indicates the status of the following options: speaker control(Ln), volume(Mn), results codes(Xn)	-	-	117(75h)
* S23	General Bit Mapped Options	-	-	58(3Ah)
S24	Sleep inactivity timer sets the length of time that the	0-255	s	0

	modem will operate in normal mode without activity on the phone or RS232 port before entering sleep mode			
S25	Delay to DTR (CT108) off sets time modem ignores DTR signal before taking action specified by &Dn	0-255	s/0.01s	5
S26	RTS-to-CTS (CT105 to CT106) delay if &R0 is set	0-255	0.01s	1
S27	General Bit Mapped Options for sync/async control(&Mn/&Qn), leased line control(&Ln), clock select(&Xn), Bell/CCITT mode(Bn)	-	-	73(49h)
S28	General Bit Mapped Options indicates options for pulse dialing(&Pn), MNP Link negotiation speed(*Hn)	-	-	0
S29	Flash Modifier Time sets the length of time the modem will go on hook if the flash dial modifier(!) is encountered in the dial string	0-255	10 ms	70
S30	Inactivity timer sets the length of time the modem will remain on line if no data is sent or received	0-255	10s	0
S31	General Bit Mapped Options	-	-	194(C2h)
S34-S35	Reserved	-	-	-
S36	LAPM Failure Control used when register S48=128	-	-	7
S38	Delay before forced hang-up (time delay between the receipt of H command to disconnect and the actual disconnect operation)	0-255	s	20
S39	Flow control bit mapped options	-	-	3
S40	General bit mapped options	-	-	104(68h)
S41	General bit mapped options	-	-	195(C3h)
S42-S45	Reserved	-	-	-
S46	Enable/Disable Data Compression	-	-	138
S48	V.42 Negotiation Control	-	-	7
S82	LAPM Break Control	-	-	128(40h)
S86	Call Failure Reason Code; when the No Carrier result code is issued, the reason for the failure is written to this register	0-255	-	-
S91	PSTN transmit attenuation level	0-15	dBm	10
S92	Fax transmit attenuation level	0-15	dBm	10
S95	Result code messages control	-	-	0
S210	V.34 Symbol Rate	0-255		13 (0Dh)

Section 8 Maintenance Information

Troubleshooting Tips

Default LED Indications

All Pocket Modem models have the following LEDs.

LED	Default Indication
Carrier Detect	This LED will come ON once a phone line connection has been established, and will remain on for as long as the connection is maintained.
Data Terminal Ready	This LED should be ON at all times.
Receive Data	This LED will come ON whenever characters are received through the phone line.
Transmit Data	This LED will come ON whenever the modem sends characters out the phone line.
Power LED	Normal Indication (All models): This LED will be ON when power is applied to the modem. Additional States (Self-Dialing only): A “Slow” blink indicates an invalid configuration. A “Fast” blink indicates that a self-dial is in process or that the modem is in “Configure Self-Dialing Parameters” mode.

Note: The RD and TD LEDs indicate the flow of characters in and out of the phone line interface of the modem, and are not directly connected to the RS232 port (all models) or RS485/RS422 port (RS-485/RS-422 Pocket Modem).

Reconnecting Serial Cables

It is important to cycle (remove and then reapply) DC power to a modem each time the RS232 or RS485/RS422 cable is disconnected and then reconnected. The serial port of the modem may not function properly if power is not cycled.

Resetting the modem (all models)

If it ever becomes necessary to completely reset the modem including both user profiles to the basic factory default settings, the following command can be issued:

```
AT&F&W&W1 [CR]
```

This command string will load the factory defaults into the active configuration (&F) and then save those settings into both user profile 0 (&W) and user profile 1 (&W1).

Note that after the modem is reset completely to the factory defaults, it will no longer be set to auto-answer, which is often necessary for the modem to work when connected to a remote device. Use the Setup Wizard to adjust these settings appropriately.

Section 9 **Product Support and Additional Documents**

FCC Requirements for Consumer Products

The Federal Communications Commission (FCC) has established rules which permit this device to be directly connected to the telephone network. Standardized jacks are used for these connections. This equipment should not be used on party lines or coin lines.

If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and until repair has been made. If this is not done, the telephone company may temporarily disconnect service.

If you have problems with your telephone equipment after installing this device, disconnect the device from the line to see if it is causing the problem. If it is, contact your supplier or an authorized agent.

The telephone company may make changes in its technical operations and procedures; if such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes.

If the telephone company requests information on what equipment is connected to their lines, inform them of:

- A) The telephone number that it is connected to,
- B) The Ringer Equivalence Number 0.3
- C) The USOC jack required RJ11, and
- D) The FCC Registration Number SKN-USA-34579-MD-E

Items (b) and (d) are indicated on the label. The ringer equivalence number (REN) is used to determine how many devices can be connected to your telephone line. In most areas, the sum of the RENs of all devices on any one line should not exceed five (5.0). If too many devices are attached, they may not ring properly.

In the event of equipment malfunction, all repairs should be performed by our Company or authorized agent. It is the responsibility of users requiring service to report the need for service to our company or one of our authorized agents.



1000 Park Drive, Lawrence PA 15055-1018

Phone: 724-746-5500

Fax: 724-746-0746

Certification Notice for Equipment Used

The Canadian Department of Communications label identifies certified equipment. This certification means the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the users satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the companies inside wiring associated with single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility – in this case, your supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. The precaution may be particularly important in rural areas.

Caution:

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician as appropriate.

The LOAD NUMBER (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

Federal Communications Commission And Canadian Department of Communications Radio Frequency Interference Statement

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or telephone reception, which can be determined by turning the equipment on and off. The user is encouraged to try and correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a different circuit from which the receiver is connected.
- Consult an experienced radio/TV technician for help.

Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the users authority to operate the equipment.

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B device.

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

Regulatory Notices

Any European Country:

(All Models) are in conformity with relevant regulatory standards following the provisions of European Council Directives: 73/23/EEC (Low Voltage Directive) and 89/336/EEC amended by 92/31/EEC (EMC Directive).

(All Models) have been approved in accordance with Council Decision 98/482/EC for pan-European single terminal connection to the public switched telephone network (PSTN). However, due to differences between the individual PSTNs provided in different countries, the approval does not, of itself, give an unconditional assurance of successful operation on every PSTN network termination point.

Australia:

(All Models) shall be connected to the Telecommunication Network through a line cord, which meets the requirements of Australian Communications Authority (ACA) Technical Standard TS008. An Australian Approved Power Supply or AC Adapter shall be utilized with the product.



Upgrading the Initialization String in an Industrial Modem

Abstract: This technical note describes differences between the AT commands supported in current and previous revisions of the Industrial, Self-Dialing and RS-485 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:

- Industrial Modem
- Self-Dialing Modem
- RS-485/422 Modem

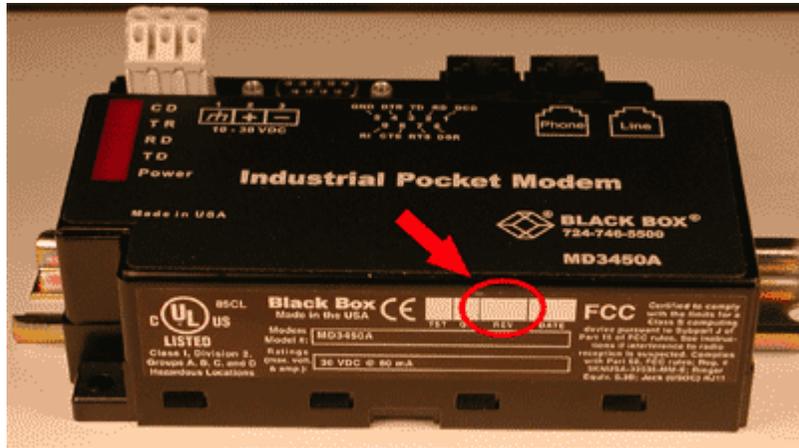
Software used:

- 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 on 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.

General Purpose

Modem Wizard	Rev 1	Rev 2	Rev 3
Back Label	1.00-1.08, 1.10-2.02	1.09	3.00 and above
HyperTerminal (ati3)	V2.100-V34_2M_DLS	P2109-V90	CX81802-V34

Self-Dialing

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

RS-485/RS-422

Modem Wizard	Rev 1	Rev 2	Rev 3
Back Label	1.00-1.02, 1.04-1.06	1.02/1.03	2.00
HyperTerminal (ati3)	V2.100-V34_2M_DLS	P2109-V90	CX81802-V34

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.”

BLACK BOX 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 automode.

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

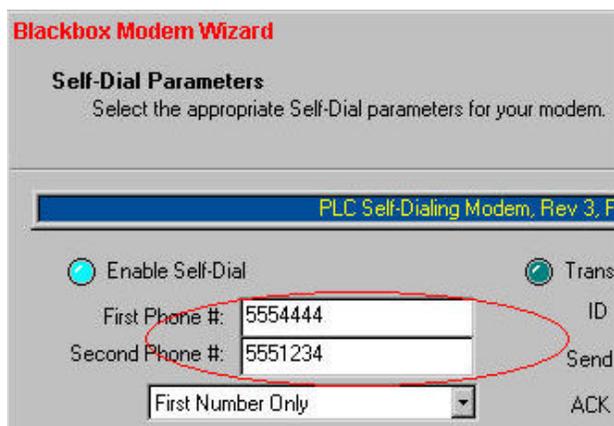
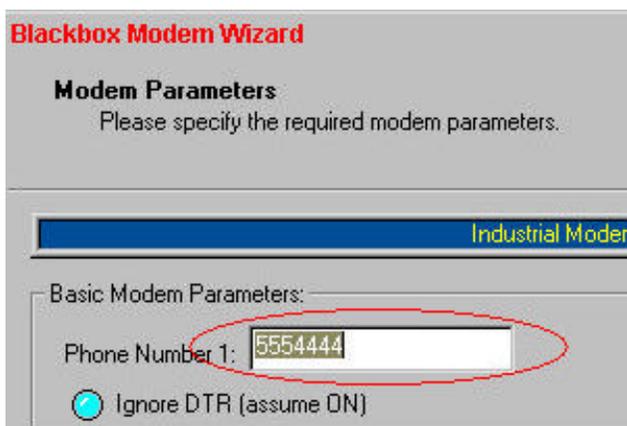
Rev 1 modem: The S23 General bit mapped register could optional be used to set the serial port parameters (baud rate, parity, and stop bits) the Rev 1 modem. The more common way, however, is to set the serial (DTE) parameters using AT<enter> or AT&W0<enter>. With the AT (attention) commands the modem 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 Modem.



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 Modem applications where the Self-Dialing Modem 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.

Customer Support Information

Service can be facilitated through our office at:



- To order or for technical support: Call 724-746-5500 or Fax: 724-746-0746
 - Technical support and fax orders 24 hours a day, 7 days a week
 - Phone orders 24 hours, 7A.M. Monday to midnight Friday; Saturday 8 to 4 (Eastern)
 - Mail order: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018
- Web site: <http://www.blackbox.com> E-mail: info@blackbox.com

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 set 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 set modem wizard. This will help the user convert any initialization sting into a set modem configuration file (*.6ms).

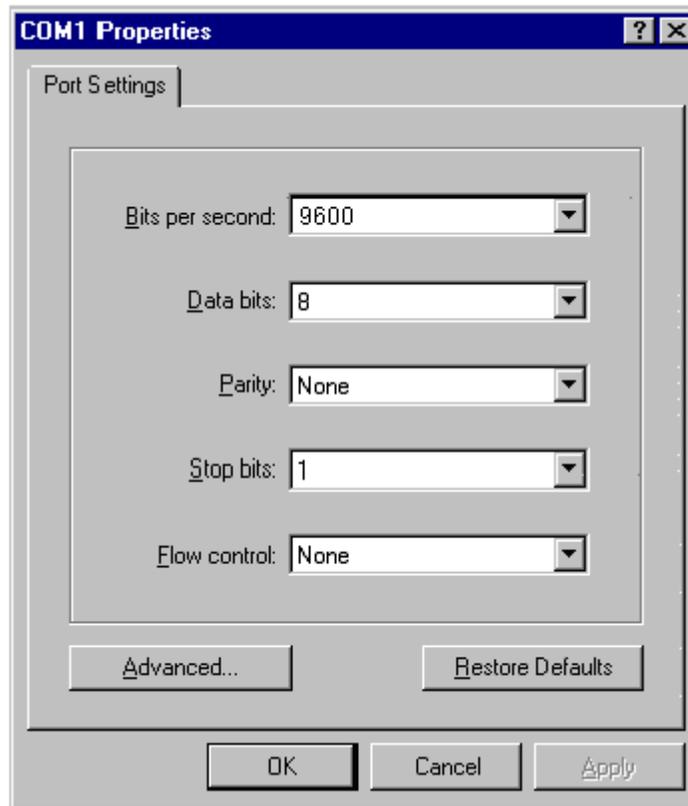
Appendix B

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 (or an equivalent 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 Industrial 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.

AS/NZS3548:1995-

WARNING: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate action.

Germany:

Diese (All Models) als Endeinrichtung vorgesehen und muss an ein TAE mit F-Kodierung angeschlossen werden. (All Models) are terminal equipment, which must be connected to the PSTN using an F-coded connector/plug.)

IEC950:1991-

The Industrial Pocket Modem shall be connected to Telecommunications Network through a line cord approved by the necessary authorities of the country. The Industrial Pocket Modem shall be utilized with a power supply approved by the necessary authorities of the country.

United Kingdom:

The modem is intended for direct connection to the analogue Public Switched Telecommunications Network and is approved for use within the United Kingdom with following features:

- Modem facility
- Auto calling facility
- Auto answering facility
- DTMF signaling

CAUTION: The analogue telecommunications interface of the modem is intended to be connected to Telecommunication Network Voltage (TNV) circuits, which may carry dangerous voltages. If it is subsequently desired to open the host equipment for any reason, the telephone cord must be disconnected prior to effecting access to any internal parts, which may carry telecommunication network voltages.

Customer Support Information

Service can be facilitated through our office at:



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