WM 1

Wireless Modem Kit

Installation & Operation Manual
Revision 1.03

May 15, 2008

Doc # E152701 Version 1.03

Electro Industries/GaugeTech

1800 Shames Drive
Westbury, New York 11590

Tel: 516-334-0870 ◆ Fax: 516-338-4741
Sales@electroind.com ◆ www.electroind.com

"The Leader in Web Accessed Power Monitoring and Control"

WM1 Wireless Modem Kit
Installation and Operation Manual
Version 1.03

Published by:
Electro Industries/GaugeTech
1800 Shames Drive
Westbury, NY 11590

Printed in the United States of America.

Customer Service and Support

Customer support is available 9:00 am to 4:30 pm, eastern standard time, Monday through Friday. Please have the model, serial number and a detailed problem description available. If the problem concerns a particular reading, please have all meter readings available. When returning any merchandise to EIG, a return authorization number is required. For customer or technical assistance, repair or calibration, phone 516-334-0870 or fax 516-338-4741.

Product Warranty

Electro Industries/GaugeTech warrants all products to be free from defects in material and workmanship for a period of four years from the date of shipment. During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, fax or call our customer-service department. You will receive prompt assistance and return instructions. Send the instrument, transportation prepaid, to EIG at 1800 Shames Drive, Westbury, NY 11590. Repairs will be made and the instrument will be returned.

Limitation of Warranty

This warranty does not apply to defects resulting from unauthorized modification, misuse, or use for any reason other than electrical power monitoring.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ELECTRO INDUSTRIES/GAUGETECH SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING FROM ANY AUTHORIZED OR UNAUTHORIZED USE OF ANY ELECTRO INDUSTRIES/GAUGETECH PRODUCT. LIABILITY SHALL BE LIMITED TO THE ORIGINAL COST OF THE PRODUCT SOLD.

Disclaimer

The information presented in this publication has been carefully checked for reliability; however, no responsibility is assumed for inaccuracies. The information contained in this document is subject to change without notice.

Document Revision History

WM1 Wireless Modem V.1.01	January 6, 2004	First version of manual
WM1 Wireless Modem V.1.02	January 22, 2007	Revisions throughout manual

Table of Contents

Chapter 1
Wireless Modem Kit - WM1

1.1: Introduction

■ The EIG Wireless Modem Kit (Model WM1) is designed to house a remote wireless modem and improve modem communication to utility meters and other IED equipment. The modem kit works with any serial communicating device. It is NOT IED specific; it allows for reliable communication with many different RS-485 devices. This self-contained unit provides remote access to meter data with simple installation. The watertight case also houses an internal 12VA power supply.

The EIG WM1 can be ordered with or without a wireless modem, allowing users to connect to most digital, wireless serial modems.

The Wireless Modem Kit (Order Number WM1-1) includes:

- A NEMA4 Waterproof case
- Power Brick 12VA Power Supply
- Modem Manager 1 RS-485/RS-232 Converter for daisy-chaining meters and buffering digital communication data
- Connecting Cables

- Wireless Modem Kit **with CDMA Data Modem** (Order Number WM1-2)
- Wireless Modem Kit **with GSM Data Modem** (Order Number WM1-3)

All parts included inside the case are fastened with industrial strength Velcro, allowing you to modify the location of the installed equipment, if necessary.

1.2: Installation Overview

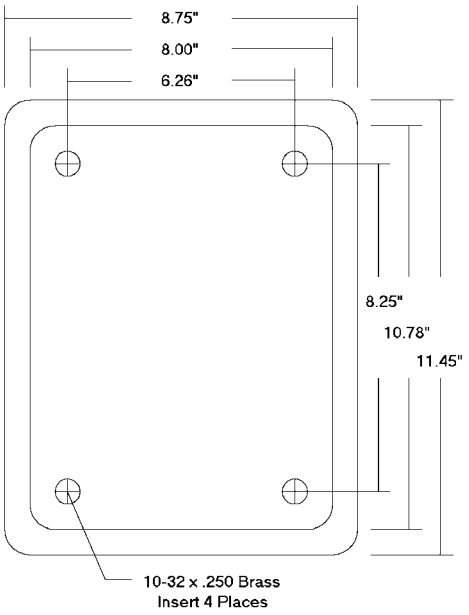
- The EIG Wireless Modem Kit requires simple installation:

1. Install the case securely on a firm surface with brass screws.
2. Follow the diagram in Chapter 2 which shows the settings for the Modem Manager 1.
3. Follow the wiring diagram in Chapter 2 to attach the RS-485 Port.
4. Wire the Power Supply into an AC/DC power source.
5. Insert the SIM Card into the GSM Data Modem SIM Holder (if ordering GSM Modem). Your wireless service provider has SIM Card or Over the Air Service Provisioning (CDMA).

1.3: Case Specifications

- NEMA4 Waterproof Case

Outside Dimensions
Height = 11.45”
Width = 8.75”
Depth = 5.43”



1.4: 12VA Power Brick Power Supply

- The unit powers the installed equipment using a Power Brick power supply. The unit provides 12VA output and has two differing input options (see specifications below).

12VA Power Brick Specifications:

Input Range: 90V AC/DC to 240V AC/DC (Default) (Option: 12V DC to 60V AC/DC)
Output Range: 9V/1A DC
Input Frequency Range: 0 - 1000Hz
Output Load Regulation (10% - 100%) ±1%
Line Regulation (over full range) ±1%
Dimensions: 2.465” (wide) x 1.51” (high) x 4.18” (long)
Technical: Short circuit protected, isolated
Compliance: IEEE C.37.90.1

1.5: Modem Manager 1

- The Modem Manager 1 is a micro-processor-based “smart” buffer. It uses internal memory to intelligently buffer data until the modem is ready to accept it. The unit also optimizes the speed of communication by using a UART at each end of the communications link. This allows modem-to-modem and modem-to-device communications to occur at different baud rates. The modems “negotiate” the best possible baud rate for given line conditions. Using this process, the Modem Manager 1 helps improve the reliability of modem communication.

Modem Manager 1 Specifications:

Baud Rate: Programmable to 57.6K Baud
Isolation: 2500V from Input to Output
Temperature: -20°C to +70°C
Power Input: 9-24V AC/DC
Port Configurations: RS232 - DB9 Female; RS485: 2- or 4-wire Connector

The Modem Manager 1 can be used as a stand-alone device to interface between any RS-232 and RS-485 device. Refer to the *Modem Manager 1 User Manual*, Version 1.7 or later, for details.

1.6: Data Modem Information

- For Data Modem specifications, refer to the Product Information and Quick Start Guide for your model of Data Modem, contained on the CD that arrived with your EIG Wireless Modem Kit.

Chapter 2
Wireless Modem Installation

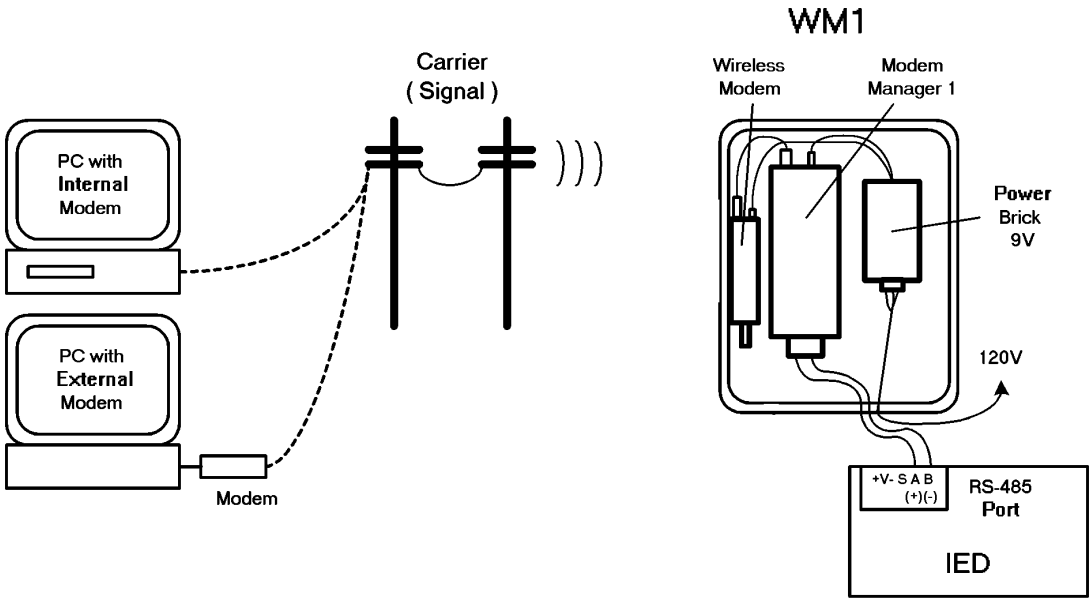


Figure 2.1: WM1 Wireless Modem Kit Installation

Figure 2.1 illustrates a **WM1 Wireless Modem Kit installation** (with a Nexus or other IED device) in a remote location, connected to a PC at another location.

2.1: Installing the WM1 Wireless Modem

1. **Install** the **case** securely on a firm surface using brass screws (see **Section 2.2**).
2. **Configure** the **Nexus** or **IED** to **communicate** with the **Modem Manager 1**. Make sure that the Baud Rate matches the Modem Manager 1 Baud Rate. (See **Section 2.6** for Nexus details.)
3. Follow the **configuration instructions** for the **Modem Manager 1** (see **Section 2.4**).
4. **Configure** the **Wireless Modem** (if needed) and attach it to the **Modem Manager 1**. Refer to the **Product Information** for your wireless modem, included on the **WM1 Wireless Modem Kit's CD**.
5. Insert the **SIM Card** into the **GSM Data Modem** SIM Holder. (if GSM Modem ordered) or obtain **Over the Air Service Provisioning** (OTASP) from a local cellular provider (**CDMA**).

NOTES:

⇨ The **SIM Card** determines the area of service for the **GSM Modem**. It must be obtained from your local wireless service provider, and must be provisioned for **Cicuit Switched Data** (this provides the digital communication option).

⇨ Refer to the **Product Information** and **Quick Start Guide** for your model of **Data Modem**, included on the **CD** that arrived with your **EIG Wireless Modem Kit**.

6. Follow the **wiring diagram** to attach the **RS485 Port**, shown in Figure 2.3. Remove **Case Sealing Plugs** to route external cables where necessary.
7. Attach a **power cord** to the **Power Brick Input Power Connector** and plug the other end into a **90V AC/DC** to **240V AC/DC** source.
8. **Default Ring Setting** that controls the number of rings is set to **2**. To modify the Ring Setting, see **Appendix A: Advanced Installation**.

2.2: Mechanical Installation

Install the **case** securely on a **firm surface** using **brass screws**. The water-tight case can be installed anywhere, but you should make sure that it is **placed** in an area that has **good reception.**

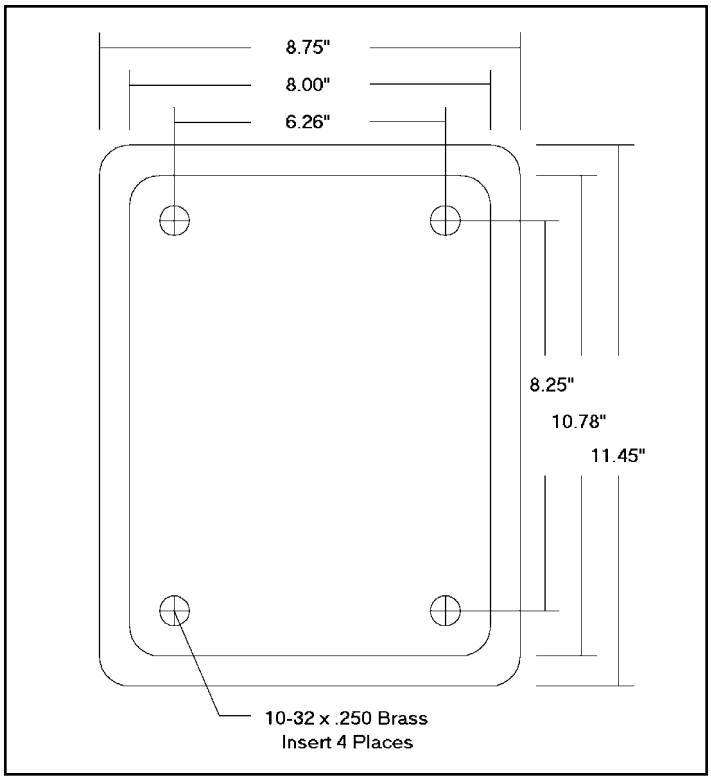


Figure 2.2: Case Dimensions

2.3: Configuring Nexus or an IED to Communicate with Modem Manager 1

To **communicate** with the **Modem Manager 1**, the **Baud Rate** of the **Nexus** or **IED** must **match**. There may be some other settings that have to be configured for your particular IED. Consult the User's Manual for the IED in use. For details on the Nexus settings, see **Section 2.6**.

2.4: Configuring the Modem Manager 1 for Communication

Figure 2.3 shows the **typical settings** for a **Nexus RS485 connection**. The RS485 Baud and Half Duplex/Full Duplex settings may be changed to fit your requirements.

SWITCH	SETTING	COMMENT
DCE/DTE:	DTE	Required
RS232 Baud:	MODEM*	Required
RS485 Baud:	38400	User Defined
Half Duplex / Full Duplex:	HALF DUPLEX	User Defined

* The **RS232 Baud Rate** is **FIXED** at **38400** in Modem position. If another Baud Rate is required for a different modem, contact the factory for a custom setting.

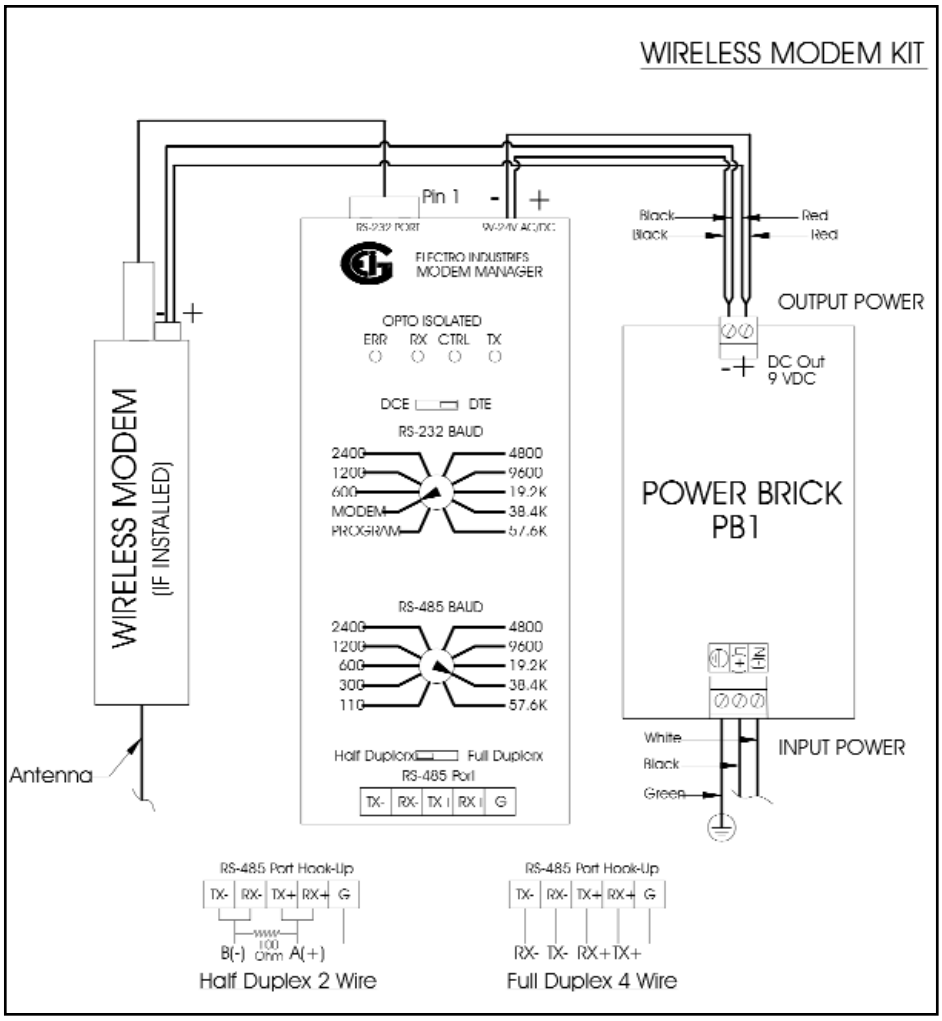


Figure 2.3: Wireless Modem Wiring

2.5: Wiring

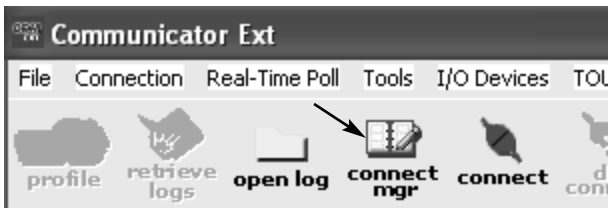
- Follow the **wiring diagram** in **Figure 2.3** to connect the **Input Power** and to connect to any **RS485 Port** of a **Nexus meter**. The Input Power cable is connected to a 120V outlet. A **Half Duplex 2 Wire** configuration (at lower left) is used for a **Nexus RS485 connection**. Other IED devices may require a Full Duplex 4 Wire RS485 configuration as shown on the right.

2.6: Configuring an IED for use with the Wireless Modem

■ Since there are many different IEDs, the Nexus meter will be used here as an example. The Nexus meter is configured using Communicator EXT software. The following steps will allow you to access data from the Nexus via a PC.

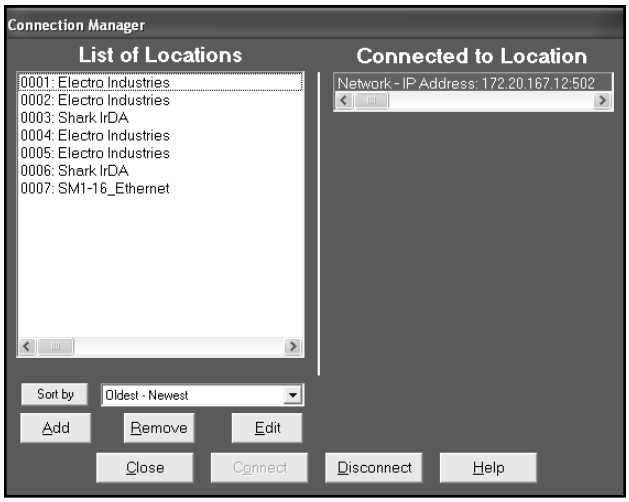
1. **Install Communicator EXT** on your PC.

2. Click on the **Communicator EXT Icon**, then the **Connect Manager (connect mgr) Icon**. You will see the **Connection Manager** screen, shown below on the right.



3. If this is the first time you are using **Communicator EXT**, the **List of Locations** will be blank.

   To **add** a **location** for your **modem**, click the **Add** button. You will see the **Connection Manager Location Editor** screen at the bottom of the page.



4. Type a **Name** in the **Location Name** field.

5. **Click** the **Serial Port radio button.**

6. Use the **pull-down menus** to select the following **settings**:

   Com Port: (The Com Port # where your Modem is located).
   Baud Rate: 38400
   Flow Control: None
   Data Bits: 8
   Stop Bits: 1
   Parity: None

7. **Click** the **Use Modem** checkbox and enter a number in the **Phone Number** field.

8. **Click Add Serial.** A device is added to the **Devices at Location** box. Click **Edit** to set up the Protocol for the Device. You will see the **Connection Manager Location Device Editor** screen, shown on the next page.

9. Enter the **Modbus Address** in the **Address** field.

10. Use the **pull-down menus** to select **Modbus ASCII** for the **Protocol** field and **Nexus** for the **Device Type** field.

    NOTE: An **IED Unit** always uses **Modbus ASCII** for **modem communication** if you are using **Modbus protocol**. Modbus RTU will not function properly.

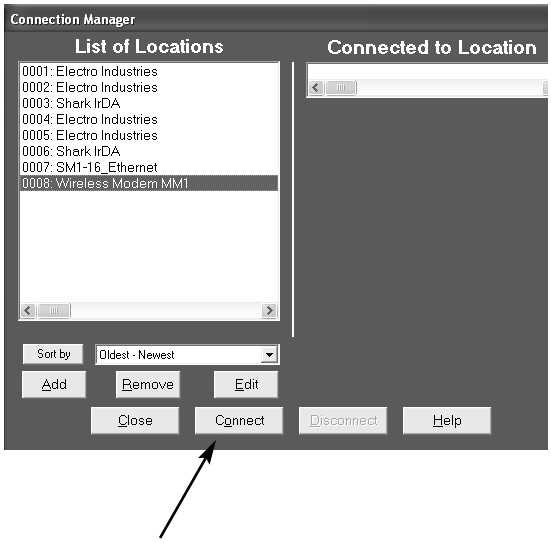
11. **Click Close** to return to the **Location Editor** screen. Use the **Add** button to add more locations, if desired.

12. **Click Close** to return to the **Connect Manager** screen.

13. From the **Connect Manager** screen, click on the **Location** for the **Wireless Modem** and then click **Connect**.

15. Click **Close** to return to the main **Communicator EXT** screen.

The wireless modem connection is now established between your **PC** and the **Nexus**. Use **Communicator EXT** to access your data.



NOTE: For complete details on Communicator EXT to access data, refer to the *Communicator EXT User's Manual*. This manual can be downloaded from our website at **www.electroind.com.**

Chapter 3
Wireless Modem Operation

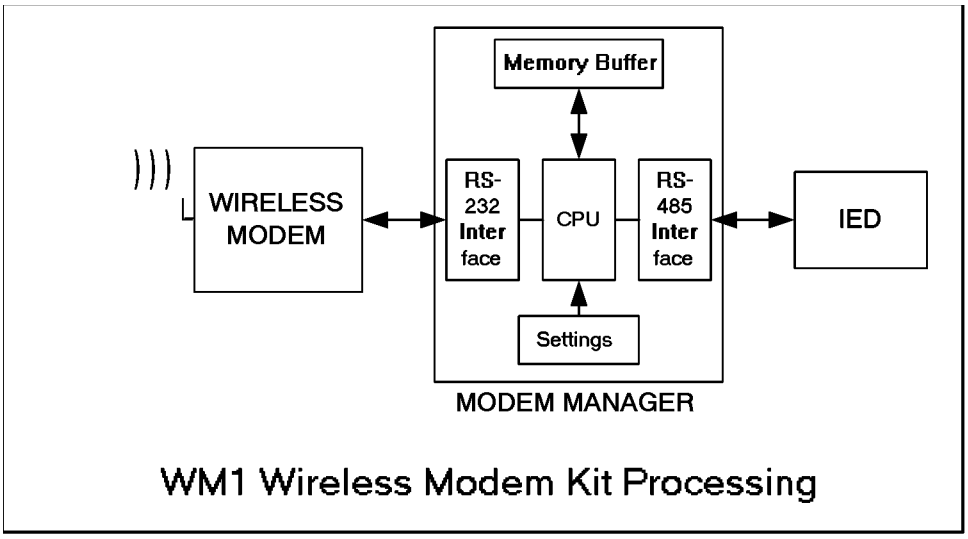
3.1: Operation Overview

■ A diagram of the **processing** of the **WM1 Wireless Modem** is shown below.

- A signal is sent to the **Wireless Modem** which is then converted to an **RS232 Serial Data Stream**.

- The **Serial Data Stream** is sent via **RS232** to the **Modem Manager**. The **Modem Manager CPU** controls buffering and the **baud rate** is **converted** as configured by the Modem Manager Settings. The **Serial Data Stream** is then **transmitted** to an **IED** via **RS485**.

- The **IED** can **transmit** or **display** the data in any number of ways.



■ Once the **WM1 Wireless Modem Kit** is **installed**, it requires only turning on the **power** to operate. Following is an **overview** of the **functioning** of the **WM1 Wireless Modem Kit**.

1. **Power on** the Wireless Modem.

2. After power up, the Modem Manager 1 **automatically** sends an **initialization string** to the modem and **waits** for a **dial-in**. In most cases, the default modem initialization string does not require modification. When there is a dial-in, the **modem** goes **online**.

The **Modem Manager 1** responds to **communication** or lack of communication on the line in the following ways:

a. After **power up**, if the modem is waiting for a dial-in (Disconnect Mode - off-line and no active communication) the Modem Manager 1 will monitor the Carrier Detect Line of the modem. It will reinitialize the modem every 10 minutes to ensure that the modem is maintained in a Valid Operational state. This prevents the modem from remaining in an invalid state where it cannot receive calls.

b. When a **dial-in has occurred** and the modem is online, the modem is in **Connect Mode**. When communication is **inactive** for 5 minutes, the Modem Manager 1 will disconnect the line, return to **Disconnect Mode** and reinitialize the modem to prevent lockout of new connections.

c. If a **loss of carrier** is detected, the Modem Manager 1 checks to **verify** the loss of carrier and **disconnects** after 45 seconds or less. A new dial-in during this period will be rejected.

d. If a **blackout occurs** or a temporary **low voltage condition**, the Modem Manager 1 will **recover** and automatically **reinitilize** the modem. This process greatly increases reliability without human intervention.

3. During **data communication**, the Modem Manager 1 acts as a **buffer** and provides **flow control** to the **modem** when the modem is not ready to receive additional data. This prevents data from being lost and prevents unecessary multiple requests for the same data (due to data communication errors). This process provides **extremely robust data communication** and reduces commu nication errors. It also supports retraining of the modem without loss of data or loss of carrier.

Appendix A
Advanced Installation

An **advanced installation** of necessary only if you need to **control** the **number of rings** after which the modem will answer or your **atypical modem** requires a **modem initialization string**. This type of installation requires a computer to run a simple terminal program, such as **Terminal** (for Windows 3.11) or **HyperTerminal** (for Windows 95 or later).

A.1: Ring Control

- The **Default Ring** setting is **2 Rings**. In order to change the number of rings, follow these steps:

  1. Use a **serial cable** to connect a **computer** to **Modem Manager 1 (MM1)**.

  2. Slide the **MM1's DCE/DTE** switch to **DCE**.

  3. Turn the **MM1's RS232 BAUD dial** to the **baud rate** set in the **terminal program**.

  4. **Power on** the **MM1**.

  5. In **Terminal** or **HyperTerminal**, **type %%%** and wait **2** seconds.
     This will put the **MM1** in **Command Mode**.

  6. Type: **R*n*(Enter)**.
     RR*n*<CR> will be returned, where *n* is the number of rings entered in the preceding step.

  7. **Disconnect** the **computer**.

  8. Complete the **installation** by following the steps listed in **Chapter 2**.

A.2: Modem Initialization String

- The modem provided with the **WM1 Wireless Modem Kit** does not require an initialization string. A few manufacturers require that a startup string be sent to their modem when it is first turned on. Once the **Modem Manager 1** (**MM1**) is given the string, it will handle the initialization automatically.

  Consult your **modem manual** to see if an initialization string is required and , if so, to determine the proper string.

  For Example: The U.S. Robotics Sportster requires the string "AT&F1".

To **store** the **initialization string** in **MM1**:

1. Use a **serial cable** to **connect** the **computer** to **MM1**.

2. Slide the **MM1's DCE/DTE** switch to **DCE**.

3. Turn the **MM1's RS232 BAUD dial** to the **Baud Rate** set in the **terminal program**.

4. **Power on** the MM1.

5. Type: **%%%** and wait **2** seconds.
   This will put the **MM1** in **Command Mode**.

6. Type: **C1>*string*(Enter)**.
   C*string*<CR> will be returned where *string* is the modem initialization string.
   If no string has been programmed, **C1<CR>** will be returned.

7. **Disconnect** the **computer**.

8. Complete the **installation** by following the steps listed in Chapter 2.

A.3: Operating Modes

- **Modem Manager 1 (MM1)** has three operating modes. **Normal Mode** and **Command Mode** are the two typically used. **Program Mode**, which is not covered here, is used for Flash Upgrades as additional features are made available.

  Normal Mode

  In **Normal Mode**, **MM1 transfers data** between its **RS232** side and its **RS485** side. It is normally positioned between a modem and remote devices. There are no commands that can be executed in **Normal Mode**.

  Command Mode

  Command Mode is used with a **PC** or **laptop** computer to **set parameters** or **check** the **MM1's status** or **software version**. The functions available in this mode are described in the next section, **Using Command Mode** (**A.4**).

  Typically, a standard **serial cable** is used to **connect** the **computer** to the **MM1**. The **MM1's DCE/DTE switch** would then be set to **DCE** and its **RS232 Baud dial** would be turned to the **Baud Rate** set in the **terminal program**.

A.4: Using Command Mode

- To enter **Command Mode** from **Normal Mode**, use **Windows HyperTerminal** or another communications program to send the following escape sequence to the **MM1**.
  Note: The "**%**" keystrokes must be made **less** than **2 seconds apart**.)

  <2 second pause> %%% <2 second pause>

- In **Command Mode**, the following can be **programmed or read**:

  The **Number of Rings** MM1 is to wait before having the modem answer the phone.

  The **Modem Initialization String**.

  The **Programmable Unit ID** (maximum of thirty characters). This can also be erased.

- In **Command Mode**, you can **read**:

  The MM1's **Status**.

  The MM1's **Product Code** ("Modem Manager 1").

  The **Version Numbers** of the Operating and Boot **Software**.

A.5: Command Mode Commands

A.5.1: Ring Number

Program Ring Number is used to specify the number of rings after which the MM1 will have the modem answer the phone. Use Read Ring Number to check the current setting.
Note: The Default Setting for rings is 2.

- **Program Ring Number**

  Type: **R*n*(Enter)**, where *n* is a digit (1-9) indicating the number of rings.

  R0<CR> will be returned, confirming that the command has been executed.
  Note: See the Command Summary for details.

- **Read Number Ring**

  Type: **RR(Enter)**

  RR*n*<CR> will be returned, where *n* is the number of rings (1-9) the MM1 is to wait before having the modem answer.

A.5.2: Modem String

Program Modem String is used to enter a **Modem Initializing String**. Use **Read Modem String** to **verify** the current setting and **Remove Modem String** to **erase** the **Modem Initialization Command**.

- **Program Modem String**

  Type: **C1*string*(Enter)**, where *string* is the Modem String (up to 254 characters).

  When properly executed, **C0<CR>** will be returned, confirming that the command has been executed.

- **Read Modem String**

  Type: **C2(Enter)**

  If no Modem String has been programmed, the result will be **C1<CR>**. Otherwise, **C2*string*<CR>** will be returned, where *string* is the Modem String.

- **Remove Modem String**

  Type: **C0(Enter)**.

  C0<CR> will be returned, confirming that the string has been erased.

  Note: See the Command Summary for details.

A.5.3: Modem Manager Unit ID

You can specify a **Unit ID** of **up to thirty alphanumeric characters** for **each MM1**.
Use **Read Unit ID** to **verify** the current **setting** and **Remove Unit ID** to **erase** the **Unit ID**.

- **Program Unit ID**

  Type: **I1*ID*(Enter)**, where *ID* is the user-defined **Unit ID**.

  I1<CR> will be returned, confirming that the user-defined **Unit ID** has been programmed.

- **Read Unit ID**

  Type: **I2*ID*(Enter)**

  I2*ID*<CR> will be returned, where *ID* is the user-defined **Unit ID.**

■ **Remove Unit ID**

Type: **I0*ID*(Enter)**

I0<CR> will be returned, confirming that the user-defined Unit ID has been erased.

Note: See the Command Summary for details.

A.5.4: Return to Normal Mode

You can specify when **MM1** returns to **Normal Mode**.

Type: **N(Enter)**

N<CR> will be returned, indicating that the MM1 is now in Normal Mode.

A.5.5: Echo

The **Echo Command** can be used to **query** the **MM1** to see if it is **responding correctly**.

Type: **A(Enter)**

A<CR> will be returned, if the MM1 is responding correctly.

A.5.6: MM1 Status

You can **check** the **position** of the **RS232 Baud switch**, the **Mode** and the **Checksum Status** of the **MM1's** software.

Type: **B(Enter)**

B*abc*<CR> will be returned, where

a is the position of the RS232 Baud switch
- 0 = Fixed Baud Rate (600, 1200, 2400, 4800, 9600, 19.2K, 38.4K or 57.6K)
- 1 = Modem
- 2 = Program

b is the current Mode of the MM1
- 0 = Program Mode
- 1 = Command Mode

c is the Operating Software's Checksum Status

A.5.7: Product Code

This command returns the **Product Code** assigned to **MM1**.

Type: **E[Enter]**

***Product Code*<CR>** will be returned, where *Product Code* is MM1's product code ("Modem Manager").

A.6: Command Summary

Description	Input	Output
Echo	A[Enter]	A<CR> verifies that MM1 is responding properly
Status: Read	B[Enter]	B*abc*<CR> *a*=RS232 Baud Switch Position 0 Fixed Baud Rate 1 Modem 2 Program *b*=MM1's Current Mode 0 Program Mode 1 Command Mode *c*=Operating Software's Checksum Status Code
RS485 Port Data Bit	BE[Enter]	BO<CR> Talk at 11 bit data
	BT[Enter]	BO<CR> Talk at 10 bit data (default)
Modem String: Remove	C0[Enter]	C*x*<CR> *x*=code 0 string has been erased 1-7 error in erasing string
Modem String: Program	C1*string*[Enter} string=modem initialization string (up to 254 characters)	C*x*<CR> *x*=code 0 string has been programmed 1-9 error in programming string
Modem String: Read	C2[Enter]	C*xstring*<CR> *x*=code 2 string follows 1 no string has been programmed

Change Mode to Program	D[Enter}	D<CR> verifies that MM1 is in Program Mode
Product Code: Read	E[Enter]	*product code*<CR> *product code*=MM1's-factory assigned product code
Help	H[Help]	Displays Help Menu
Unit ID: Remove	I0[Enter]	I*x*<CR> *x*=code 0 Unit ID has been erased 1-6 error in erasing Unit ID
Unit ID: Program	I1*ID*[Enter] *ID*=unique user-assigned Unit ID (up to 30 alpha-numeric characters)	I*x*<CR> *x*=code 0 Unit ID has been programmed 1-6 error in programming Unit ID
Unit ID: Read	I2[Enter]	I*x**ID*<CR> *x*=code 2 Unit ID follows 1 No Unit ID has been programmed *ID*=Unit ID
Reset	K[Enter]	K<CR> verifies that MM1 has been reset
Change Mode to Normal	N[Enter]	N<CR> verifies that MM1 is in Normal Mode
Operating Software Version	P[Enter]	P*n*<CR> *n*=three-digit version number of MM1's operating software
Boot Software Version	Q[Enter]	Q*n*<CR> *n*=three-digit version number of MM1's boot software
Ring Number: Program	R*n*[Enter] *n*=number of rings (1-9) MM1 is to wait before having the modem answer	R*x*<CR> *x*=code 0 Ring Number has been programmed 1-7 error in programming Ring Number
Ring Number: Read	RR[Enter]	RR*n*<CR> *n*=number of rings (1-9) MM1 is to wait before having the modem answer
Product Status	S[Enter]	Displays MM1 parameters

A.7: Entering Command Mode

To enter **Command Mode** from **Normal Mode**, use a **communications program** to send the following escape sequence to **MM1**:

<2-second pause>%%%<2-second pause>

Note that the "**%**" keystrokes must be made **less than 2 seconds apart**.