Modem Manager 1

EIG Model MM1, a
smart RS485-to-RS232
converter with modem-
enhancing features

User Manual and
Reference Guide
Version 1.7

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Customer Service and Support

Customer support is available 9:00 a.m. to 4:30 p.m., 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 one year 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.

OUR PRODUCTS ARE NOT TO BE USED FOR PRIMARY OVER-CURRENT PROTECTION. ANY PROTECTION FEATURES IN OUR PRODUCTS ARE TO BE USED FOR ALARM OR SECONDARY PROTECTION ONLY.

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.

Statement of Calibration

Our instruments are inspected and tested in accordance with specifications published by Electro Industries/GaugeTech. The accuracy and calibration of our instruments are traceable to the National Bureau of Standards through equipment that is calibrated at planned intervals by comparison to certified standards.

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.

Electro Industries/ GaugeTech

Electro Industries/GaugeTech was founded in 1973 by engineer and inventor Samuel Kagan. Dr. Kagan's first innovation, which revolutionized the power-monitoring field, was the development of an affordable, easy-to-use AC power meter. In the 1980s, Dr. Kagan and his team at EIG developed a digital multifunction monitor. This monitor, with its ability to measure every aspect of power, transformed AC power metering and power distribution.

Under Dr. Kagan's leadership, EIG again developed a product that surpassed everything else on the market: the Futura + device. It supplied all the functionality of a fault recorder, an event recorder and a data logger in the configuration of a single meter.

Today, as a leader in the development and production of power-monitoring products, EIG aspires to attain zero-defect manufacturing.

Products

All of EIG's products are designed, manufactured, tested and calibrated at our facility in Westbury, New York. EIG manufactures the most sophisticated digital power monitors available. Our products handle such things as:

- Multifunction power monitoring
- Power-quality monitoring
- Onboard data logging for trending power usage and quality
- Disturbance analysis

EIG manufactures both single and multifunction digital power monitors. These utility-grade devices are highly reliable and sophisticated.

Futura+ Series

As the ultimate power-quality monitor, the Futura+ is widely used at automated substations. In addition to having nearly all of the capabilities of DM meters, it also handles:

- Power-quality monitoring
- High-accuracy AC metering
- Onboard data logging
- Onboard fault and voltage recording

DM Series

DM meters are the substation standard for many utilities and large industrial companies. These three-phase multifunction monitors measure every aspect of power.

- Wattage, voltage, amperage, var, VA, power factor, frequency and harmonics (%THD)
- Protocols: Modbus, Modbus Plus, DNP 3.0 and Ethernet
- Analog outputs (0-1 and 4-20mA)

Single-Function Meters

- AC voltage and amperage
- DC voltage and amperage
- AC wattage
- Single-phase monitoring with maximum and minimum demands
- Transducer readouts

Portable Analyzers

- Power-quality analysis
- Energy analysis

Modem Manager 1

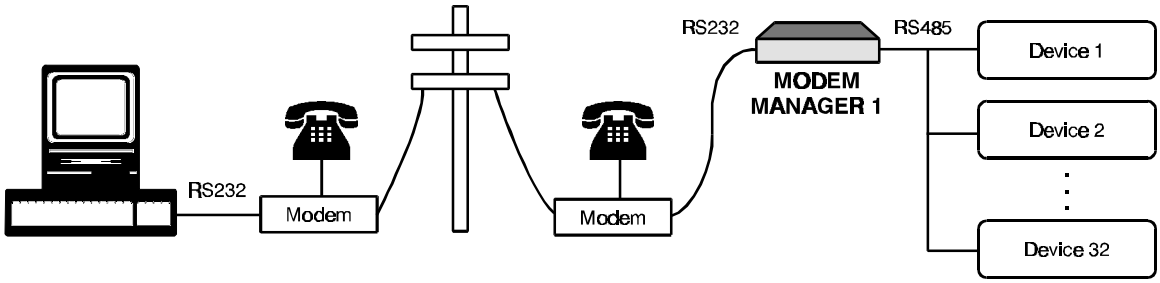
Appendices

Overview

Problem

A diagram of a typical remote communication over a phone line to a bus of RS485 devices is shown below.

Modems are designed to operate with computers and require several control lines to function properly. Because these control lines are not available on an RS485 bus, modems are less suitable for and more difficult to use in remote applications.



Typical phone lines are voice grade and the quality of the connection can vary from location to location. Modems are designed to communicate with each other by negotiating a baud rate that provides the most reliable data transfers. This can range from 300 to 57.6 baud. However, the baud rate of an RS485 bus is fixed, thus limiting the modems to communicating at this fixed rate. If this rate cannot be negotiated, the connection cannot be established.

Another problem is line dropouts. Even if the communication rate is established, noise can cause intermittent line dropouts. Since there are no control lines on an RS485 bus, there is no way to stop the flow of data to the modem. In many cases, the modem buffer fills and overruns, causing loss of data, communication errors, and in many cases, loss of the actual connection. There is also the issue of determining how the remote modem will answer, and after how many rings.

The above all lead to the fact that special programming of the modem is required. The user must fix the baud rate to that of the RS485 bus, set auto answer and set the number of rings to answer on, among other things. This is not a simple task. If all goes well and there is a good phone connection, the system works. Often it does not.

Also, to reprogram a modem, you must implement the change at the remote site. More often than not, two people are needed to effect a modem change; to test the modem, another technician is needed at the other end to verify the success of the communication. These issues combine to make modem programming difficult, time-consuming and often expensive.

Solution

Modem Manager 1 solves all of these problems. It contains all the lines necessary to control the modem. Its large buffer and independent communication ports permit modems to negotiate optimum communication rates while allowing fixed RS485 bus rates. It initializes the modem, it answers the phone when a call is received and it controls the flow of data to the modem during dropouts. This eliminates most common problems.

This device improves all forms of communication, from noisy phone lines to cellular communications and radio transmissions. While no communication is in progress, the MM1 periodically resets the modem (every five to ten minutes) to clear any glitches or hangups due to power dropouts. In the vast majority of cases, no modem programming is required. See Installation below for the simple way to set up a remote system.

Requirements

Modems

The local and remote modems can be of any type or speed.

Remote Devices

These can be any devices that communicate over an RS485 port.

Installation

The majority of modems can be used right out of the box. See Simple Installation for the quickest way to set up a remote system. This works in almost all cases. Use the Advanced Installation if your modem requires an initialization string or you would like to specify the number of rings after which the modem will answer.

Simple Installation

- Turn the Modem Manager's RS485 BAUD dial to reflect the RS485-bus baud rate.
- Turn the Modem Manager's RS232 BAUD dial to MODEM.
- Slide the Modem Manager's DCE/DTE switch to DTE.
- Slide the Modem Manager's Half Duplex/Full Duplex switch to Half Duplex for a 2-wire RS485 bus or Full Duplex for a 4-wire RS485 bus.
- Plug the Modem Manager's 9V AC/DC plug into an outlet.
- Connect the phone line to the modem.
- Use a serial cable to connect the modem to the Modem Manager.
- Connect the Modem Manager to the RS485 bus. (See the appendices for diagrams of a typical RS485-bus connection.)
- Turn the modem on and then turn the Modem Manager on.

Advanced Installation

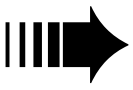
An advanced installation is necessary only if you need to control the number of rings after which the modem will answer, or your atypical modem requires a modem initialization string. This type of installation requires a computer to run a simple terminal program, such as Terminal (for Windows 3.11) or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

- Rings
  - Use a serial cable to connect the computer to Modem Manager 1.
  - Slide the Modem Manager's DCE/DTE switch to DCE.

- Turn the Modem Manager's RS232 BAUD dial to the baud rate set in the terminal program.
- Turn the Modem Manager on.
- Type: %%% and wait two seconds. (This will put the MM1 in Command mode.)
- Type: Rn[Enter], where n is the number of rings after which the modem will answer. R0<CR> should be returned.
- To verify, type: RR[Enter]. RR n<CR> will be returned, where n is the number of rings entered in the preceding step.
- Disconnect the computer.
- Complete the installation by following the steps listed above in Simple Installation.

■ Modem String: A few manufacturers require that a startup string be sent to their modem when it is first turned on. Once Modem Manager 1 is given the string, it will handle this automatically. (Consult your modem manual to find out if this is required and to determine the proper string. The U.S. Robotics Sportster, for example, requires the string "AT&F1.") To store the string in MM1:

- Use a serial cable to connect the computer to Modem Manager 1.
- Slide the Modem Manager's DCE/DTE switch to DCE.
- Turn the Modem Manager's RS232 BAUD dial to the baud rate set in the terminal program.
- Turn the Modem Manager on.
- Type: %%% and wait two seconds. (This will put the MM1 in Command mode.)
- Type: C1>string[Enter], where string is the modem initialization string. The response will be C0<CR>.



Use the following format to program multiple modem strings (of up to a total of 254 characters):
C1>string 1<>string 2<>string 3 ... string n<CR>.

- To verify, type: C2[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.)
- Disconnect the computer.
- Complete the installation by following the steps listed above in Simple Installation.

Operation

Operating Modes

Modem Manager 1 has three operating modes. Normal mode and Command mode are the two typically used. Program mode, which is not covered in this manual, is designed to be used for flash upgrades as additional features are made available.

Normal Mode

In Normal mode, Modem Manager transfers data between its RS232 side and its RS485 side (usually it is 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 standard or laptop computer to set parameters or check the Modem Manager's status or software version. The functions available in this mode are described below.

Typically, a standard serial cable is used to connect the computer to the Modem Manager. The Modem Manager'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.

- To enter Command mode from Normal mode, use Windows 95 HyperTerminal or another communications program to send the following escape sequence to the Modem Manager. (Note: The "%" keystrokes must be made less than two seconds apart.)

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

- In Command mode, the following can be programmed or read:
  - The number of rings Modem Manager 1 is to wait before having the modem answer the phone.
  - The modem initialization string. This can also be erased.
  - The programmable unit ID (a maximum of thirty characters). This can also be erased.
- In Command mode, you can read:
  - The Modem Manager's status.
  - The Modem Manager's product code ("Modem Manager 1").
  - The version numbers of the operating and boot software.

Command-Mode Commands

Ring Number

Program Ring Number is used to specify the number of rings after which the Modem Manager will have the modem answer the phone. Use Read Ring Number to check the current setting.

- Program Ring Number
  - Type: Rn[Enter], where n is a digit (1-9) indicating the number of rings.
  - R0<CR> will be sent back, confirming that the command has been executed. (See the Command Summary in the Appendix for details.)
- Read Ring Number
  - Type: RR[Enter]
  - RR n<CR> will be returned, where n is the number of rings (1-9) the Modem Manager is to wait before having the modem answer.

Modem String

Program Modem String is used to enter a modem initialization string. Use Read Modem String to verify the current setting and Remove Modem String to erase the modem initialization command.

- Program Modem String
  - Type: C1string[Enter], where string is the modem string (of up to 254 characters).
  - When properly executed, C0<CR> will be sent back. (See the Command Summary in the Appendix for details.)
- 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. (See the Command Summary in the Appendix for details.)

- Remove Modem String
  - Type: C0[Enter]
  - C0 < CR > will be returned, indicating that the string has been erased. (See the Command Summary in the Appendix for details.)

Modem Manager Unit ID

You can specify a unit ID of up to thirty alphanumeric characters for each Modem Manager. This unit ID can be programmed, read or erased.

- Program Unit ID
  - Type: I1ID[Enter], where ID is the user-defined unit ID.
  - I0 < CR > will be returned, confirming that the user-defined unit ID has been programmed. (See the Command Summary in the Appendix for details.)
- Read Unit ID
  - Type: I2[Enter]
  - I2 ID < CR > will be returned, where ID is the user-defined unit ID. (See the Command Summary in the Appendix for details.)
- Remove Unit ID
  - Type: I0[Enter]
  - I0 < CR > will be returned, confirming that the user-defined unit ID has been erased. (See the Command Summary in the Appendix for details.)

Return to Normal Mode

To go to Normal Mode:

- Type: N[Enter]
- N < CR > will be returned, indicating that the Modem Manager is now in Normal mode.

Echo

The echo command can be used to query the Modem Manager to find out if it is responding correctly.

- Type: A[Enter].
- A<CR> will be returned if the Modem Manager is responding correctly. (See the Command Summary in the Appendix for details.)

Modem Manager Status

- Type: B[Enter]
- Babc<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 mode the Modem Manager is in
    - — 0 = Program mode
    - — 1 = Command mode
  - c is the operating software's check-sum status

Product Code

This command returns the product code assigned to Modem Manager 1.

- Type: E[Enter]
- Product code<CR> will be returned, where product code is Modem Manager 1's product code ("Modem Manager 1").

Resetting the Modem Manager

The Modem Manager will automatically reset after five to ten minutes if it has not received anything from either a computer or a remote device.

- After a reset, the Modem Manager automatically reverts to Normal mode and transmits the modem initialization string, if any.
- To manually reset the Modem Manager, use the following command. (See the Command Summary in the Appendix.)
  - Type: K[Enter]
  - K<CR> will be returned, indicating that the Modem Manager has been reset.

Operating Software Version

- Type: P[Enter]
- Pn<CR> will be returned, where n is the three-digit version number of the operating software.

Boot Software Version

- Type: Q[CR]
- Qn<CR> will be returned, where n is the three-digit version number of the boot software.

Help

- Type: H[Enter]
- A Help menu will be returned, listing all Command-Mode Commands.

Product Status

- Type: S[Enter]
- The following Modem Manager 1 parameters will be returned.
  - Boot Version
  - Software Version
  - RS232 Switch
  - Modem on RS232
  - Current Mode
  - Ring Number
  - RS485 Data Bit
  - User ID
  - Modem String

RS485 Port Data Bit

Use this command when you wish to transmit data from an 11-bit port. The Modem Manager will receive the 11-bit data at the RS485 port, convert it to 10-bit data, and transmit it through the RS232 port.

- To talk at 11-bit data:
  - Type: BE[Enter]
  - B0<CR> will be returned.
- To talk at 10-bit data (the default value):
  - Type: BT[Enter]
  - B0<CR> will be returned.

Appendix 1:
Command Summary

Description	Input	Output
Echo	A[Enter]	A < CR > verifies that MM1 is responding properly
Status: Read	B[Enter]	Babc < 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 check-sum 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]	Cx < CR > x = code 0 string has been erased 1-7 error in erasing string
Modem String: Program	C1string[Enter] string = modem initialization string (up to 254 characters)	Cx < CR > x = code 0 string has been erased 1-9 error in programming string
Modem String: Read	C2[Enter]	Cx string < CR > x = code 2 string follows 1 no string has been programmed string = modem initialization string
Change Mode to Program	D[Enter]	D < CR > verifies that MM1 is in Program mode

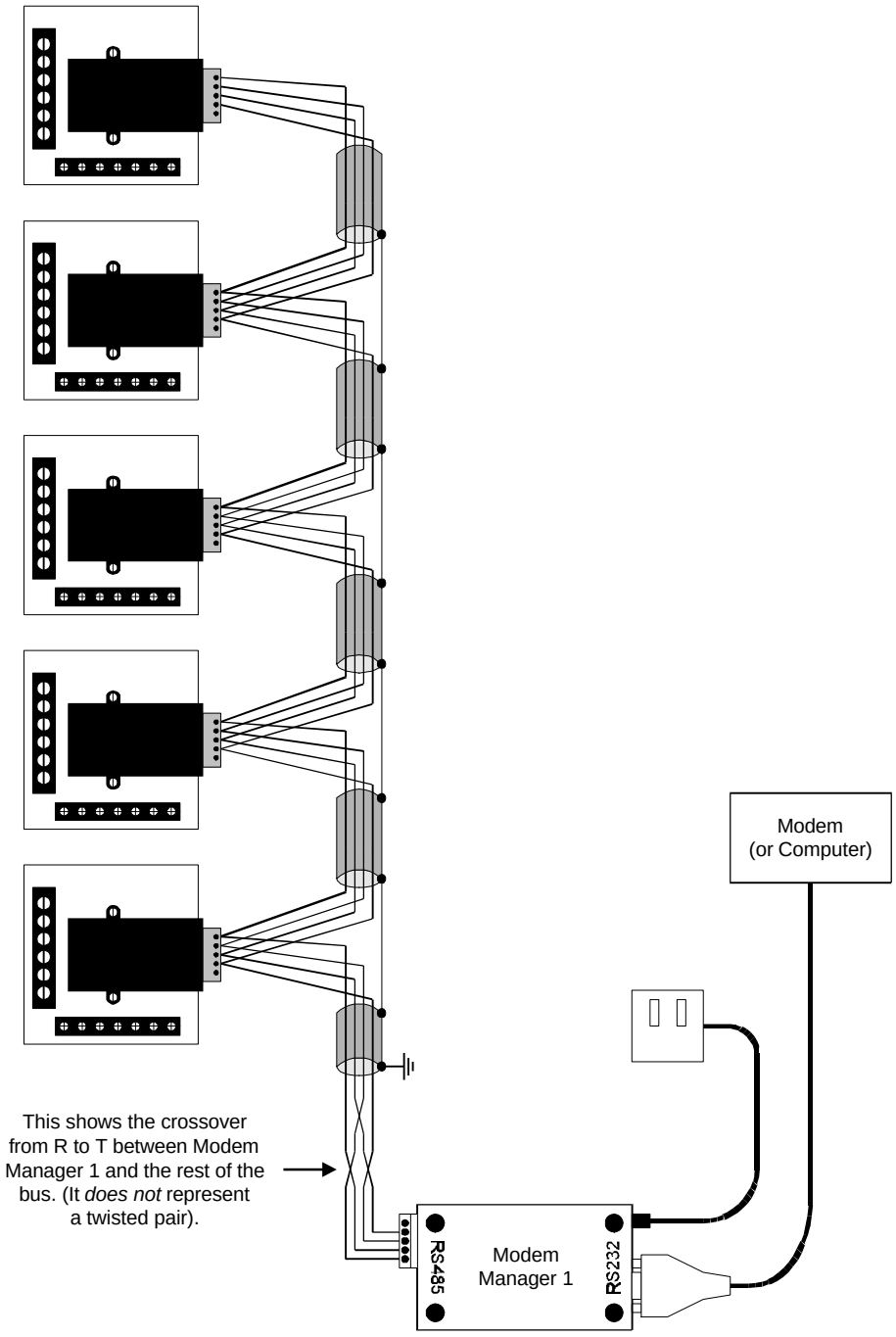
Description	Input	Output
Product Code: Read	E[Enter]	product code < CR > product code = MM1's factory-assigned product code
Help	H[Help]	Displays Help menu
Unit ID: Remove	I0[Enter]	Ix < CR > x = code 0 unit ID has been erased 1-6 error in erasing unit ID
Unit ID: Program	I1ID[Enter] ID = unique user-assigned unit ID (up to 30 alphanumeric characters)	Ix < CR > x = code 0 unit ID has been programmed 1-6 error in programming unit ID
Unit ID: Read	I2[Enter]	Ix 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 Modem Manager 1 is in Normal mode
Operating Software Version	P[Enter]	Pn < CR > n = three-digit version number of MM1's operating software
Boot Software Version	Q[Enter]	Qn < CR > n = three-digit version number of MM1's boot software

Description	Input	Output
Ring Number: Program	Rn[Enter] n = number of rings (1-9) MM1 is to wait before having the modem answer	Rx < 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 Modem Manager 1 parameters

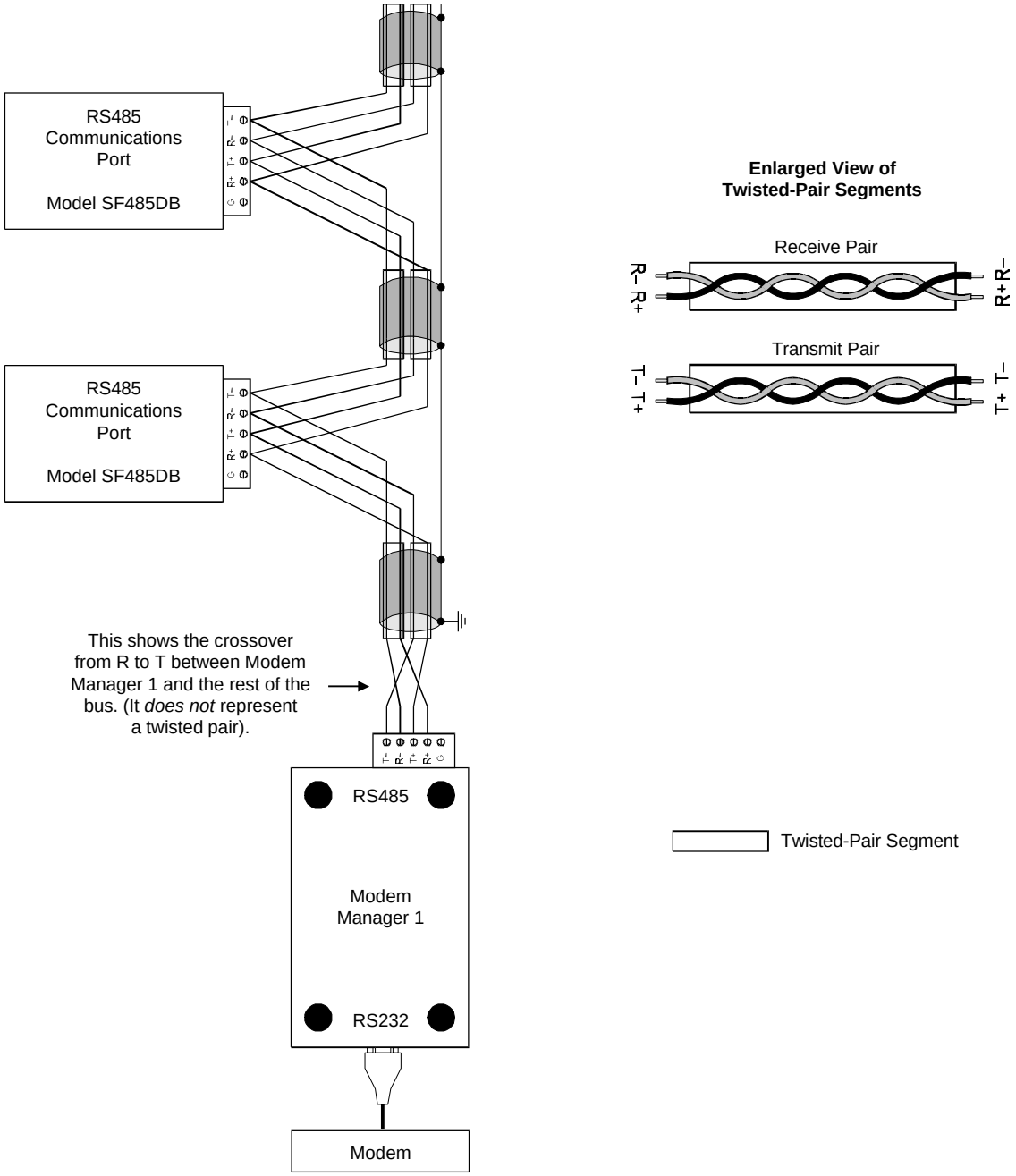
To enter Command mode from Normal mode, use a communications program to send the following escape sequence to the Modem Manager:
< 2-second pause > %%% < 2-second pause >
Note that the "%" keystrokes must be made less than two seconds apart.

Appendix 2:
RS485 Bus Connections

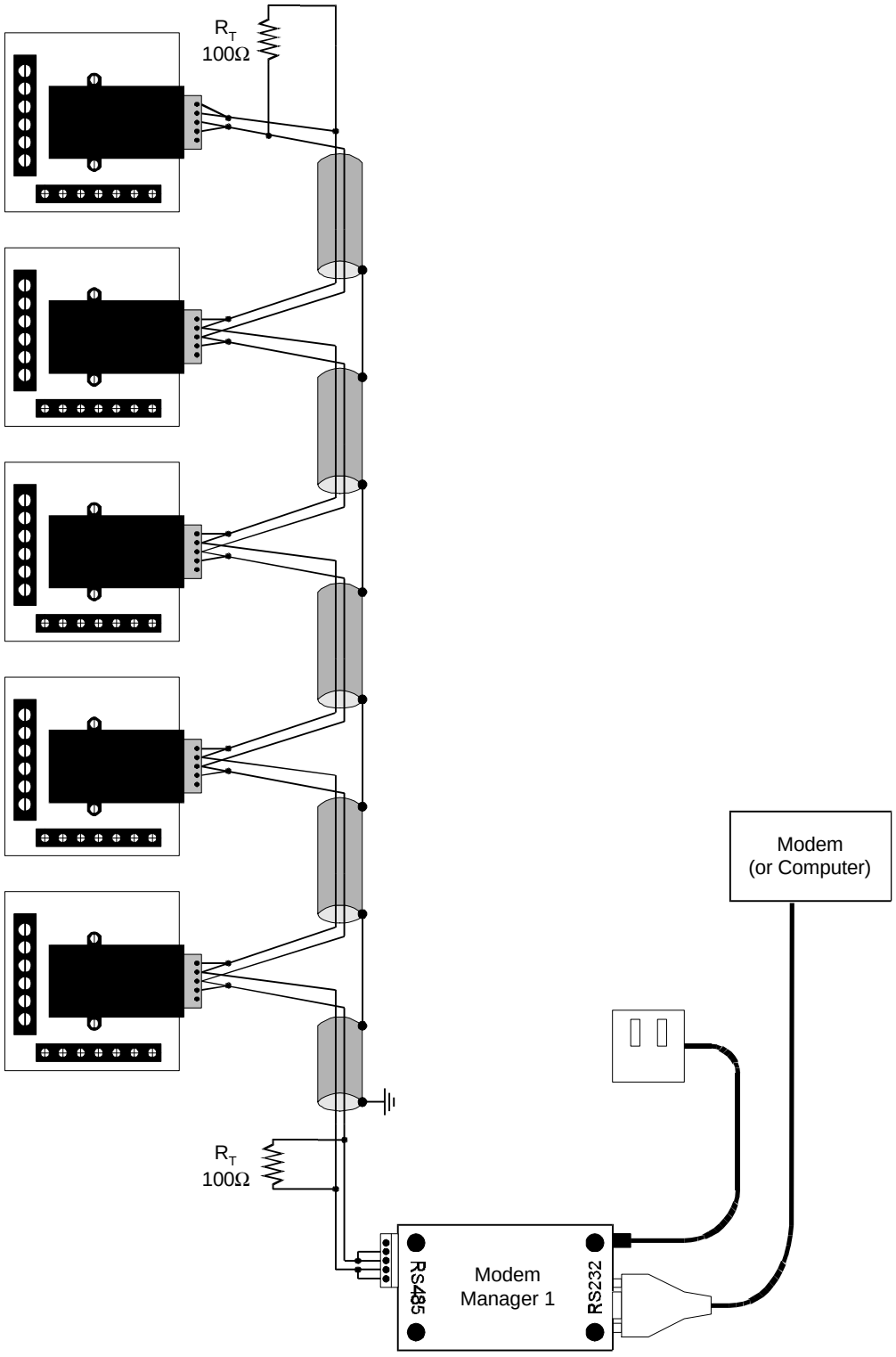
Overview: Four Wire (Full Duplex)



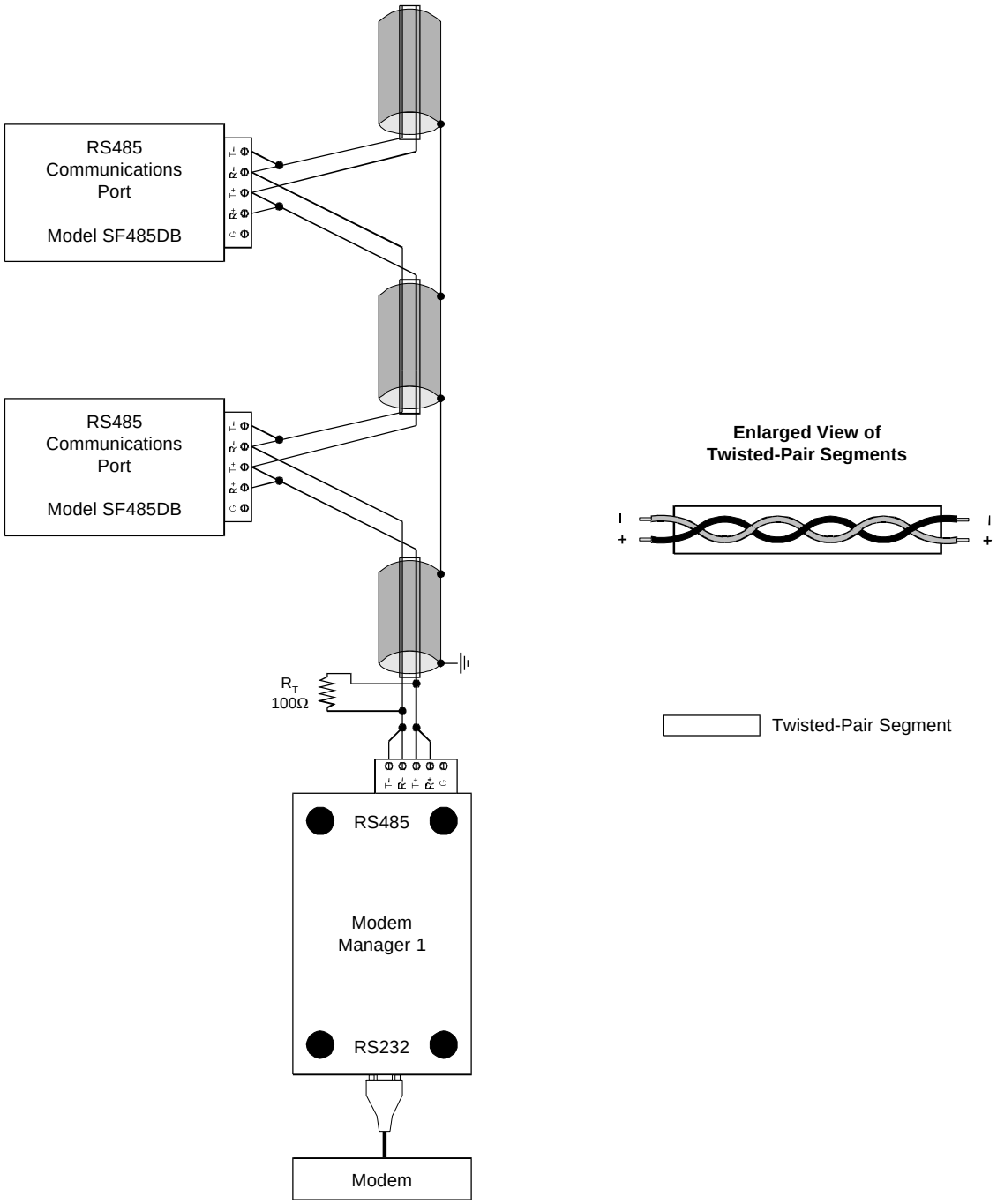
RS485 Bus Connections
Details: Four Wire (Full Duplex)



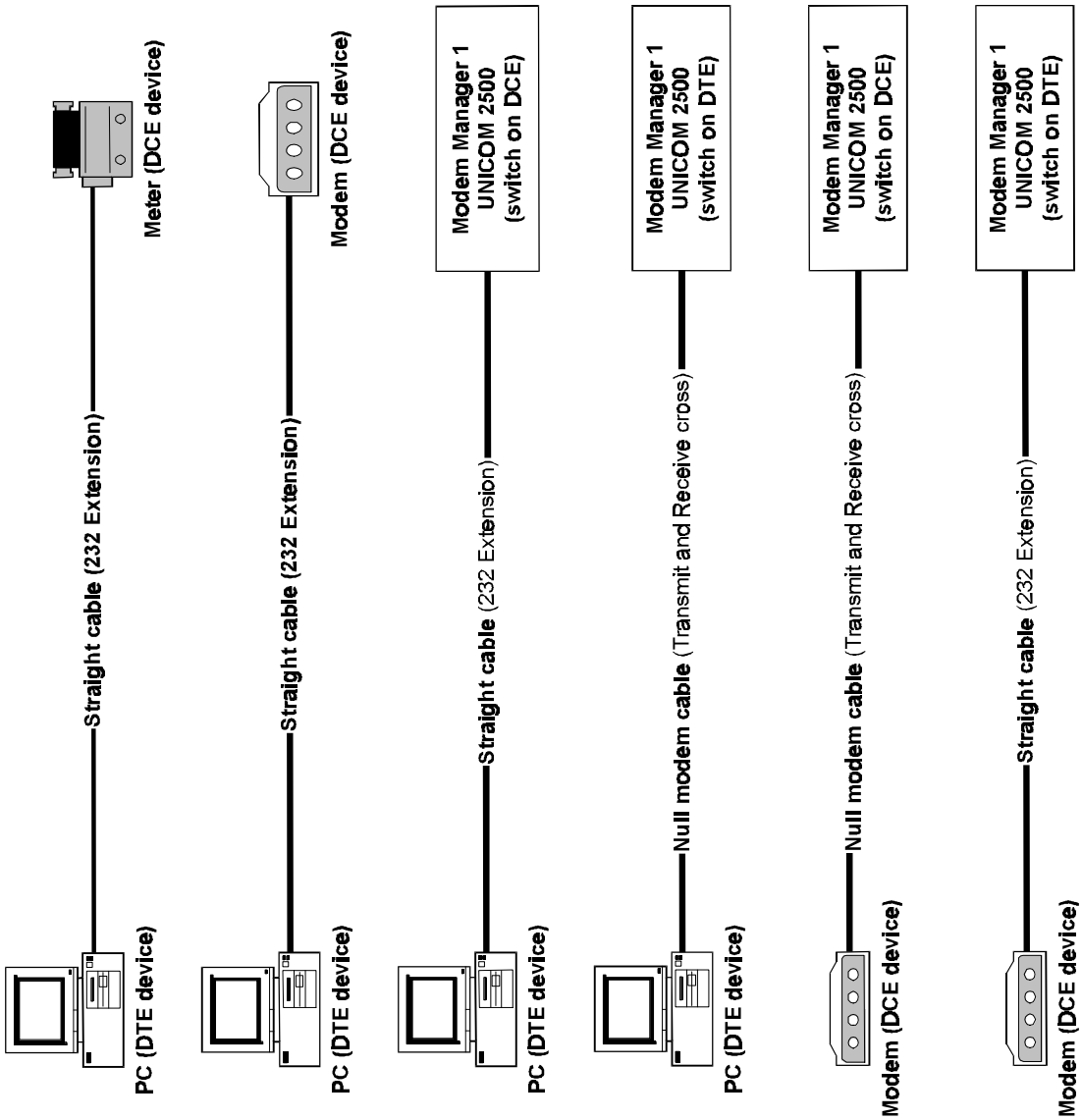
RS485 Bus Connections
Overview: Two Wire (Half Duplex)



RS485 Bus Connections
Details: Two Wire (Half Duplex)



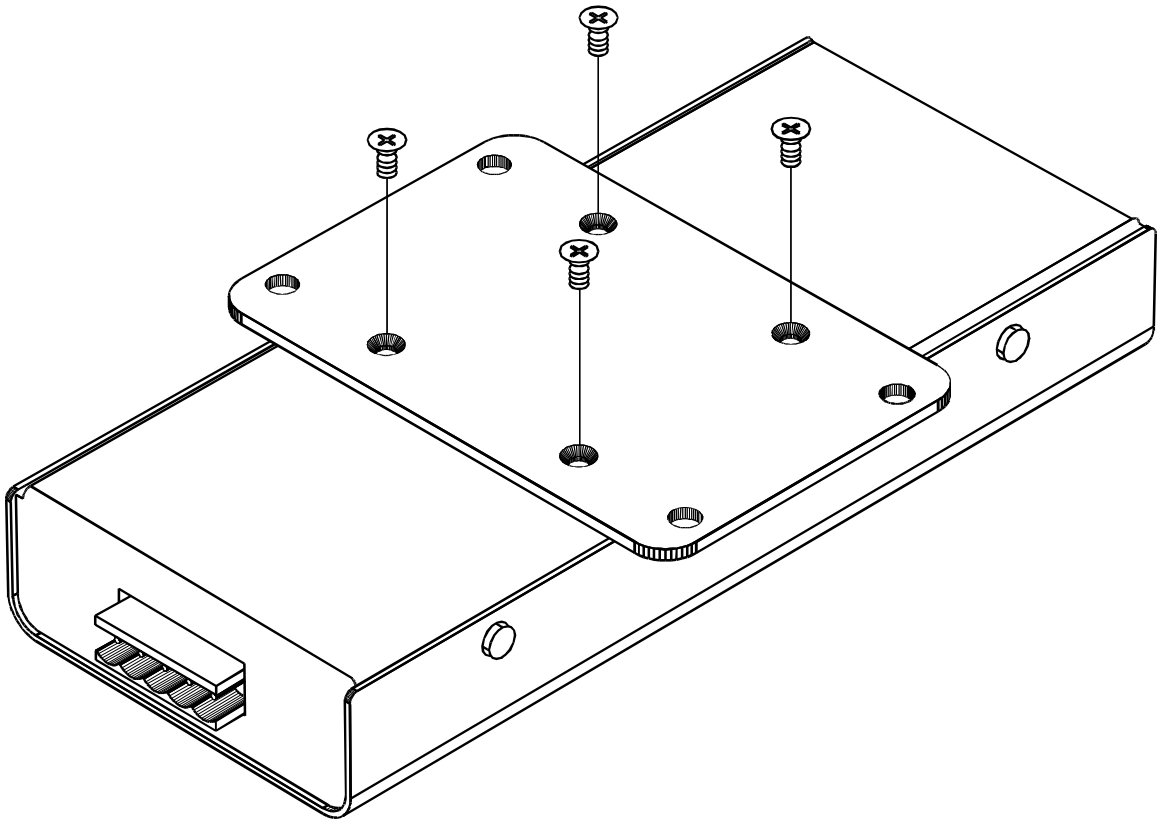
Appendix 3:
RS232 Connections



Appendix 4:
Specifications

Power Voltage Requirements	9-30V DC or 7-20V AC
Maximum Power Consumption	3VA
Isolation Voltage	2500V RMS (RS232 to RS485)
Data Rate	300-57,600 baud
LED Indicators	ON (power) ERR (error) RX (receive) CTRL (control) TX (transmit)
Switches	DTE/DCE selection RS232 baud-rate selection RS485 baud-rate selection Half/full duplex selection (HD/FD)
Ports and Connectors	RS232: DB9 female RS485: 2- or 4-wire detachable terminal block
Enclosure	Rugged aluminum, resistant to electromagnetic interference
Dimensions	Length: 6⅞″ (168.3mm) Width: 2⅞″ (72.0mm) Height: 1″ (25.4mm)
Mounting	Stand alone or wall mount (mounting plate supplied)
Operating Temperature	–20 to +70°C

Appendix 5:
Bracket Installation



Appendix 6:
Mounting Information