Modbus Plus Adapter

EIG Model MP1,
a Modbus Plus adapter
for DMMS 300+ and
Futura+ Monitors

User Manual and
Reference Guide
Version 1.6

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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 of defects in material and workmanship for one year from the date of shipment. During the warranty period, we will, at our option, 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. Send the instrument, transportation prepaid, to Electro Industries/ GaugeTech 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

Elec tro In dus tries/GaugeTech was founded in 1973 by en gi neer and in ven tor Sam uel Ka gan. Dr. Ka gan's first in no va tion, which revo lu tion ized the power- monitoring field, was the de vel op ment of an af ford able, easy- to- use AC power me ter. In the 1980s, Dr. Ka gan and his team at EIG de vel oped a digi tal mul ti func tion moni tor. This moni tor, with its abil ity to meas ure every as pect of power, trans formed AC power me ter ing and power dis tri bu tion.

Un der Dr. Ka gan's lead er ship, EIG again de vel oped a prod uct that sur passed everything else on the mar ket: the Fu tura + de vice. It sup plied all the func tion al ity of a fault re corder, an event re corder and a data log ger in the con figu ra tion of a sin gle me ter.

To day, as a leader in the de vel op ment and pro duc tion of power- monitoring prod ucts, EIG aspires to at tain zero- defect manu fac tur ing.

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
- On board 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
- On board data logging
- On board fault and voltage recording
- Ten channels of analog outputs

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

Table of Contents

Overview

Introduction

The Modbus Plus Adapter (MP1) is handy gadget that allows a Futura+ or DMMS 300+ monitor to communicate over a Modbus Plus network. The monitor becomes just another node on the network: It can take full advantage of the speed of the Modbus Plus architecture. A monitor equipped with an MP1 can be polled by other nodes on the same network, or by nodes on adjacent bridged networks. The MP1 can be configured to globally broadcast any 32 registers of information. This rugged device is opto isolated and features an upgradable flash RAM.

Use the MP1 to:

- Convert Modbus to Modbus Plus.
- Poll meters for Modbus Plus global variables and present them to a Modbus Plus network.
- Program:
  - The meter address.
  - The meter baud rate.
  - The global variables to poll.
- Read the meter's Modbus Plus address (which is set with its top switches).

To program the MP1, all you need is the MP Cable and an RS485 two-wire terminal interface operating at 19.2 kilobaud. Just connect the MP1 between the monitor and the network, and you're off and running.

Installation

The Modbus Plus Adapter supports a single meter in register polling and global variables. Use a terminal interface to program the global variables, meter address and baud rate.

MP1 Installation

- Set the MP1's address to 1 (1,0).
- Slide the MP1's PROG/NORM switch to NORM.
- Plug the 5-pin meter connector cable (MP Cable) into both the meter and the MP1.
- Attach the DB9-female connector to the Modbus Plus network.

Meter Installation

Most meters can be used right out of the box, because the required settings are the default values. If necessary:

- Set the meter address to 1.
- Set the baud rate to 9600.
- Set the protocol to Modbus RTU.

Operation

Operating Modes

Normal Mode

In Normal mode, the MP1 transfers data between its meter side and its Modbus Plus side. No commands can be executed in Normal mode.

Program Mode

Program mode is used with a computer to read, set and erase parameters, or check the MP1's status or boot software version. The functions available in this mode are described below. (See Appendix 1: Command Summary.)

In Program mode, you can read, program or erase:

- The meter's baud rate.
- The meter's address.
- The global registers.

In Program mode, you can read:

- The MP1's product code.
- The boot software version.

Programming the MP1

To program the MP1:

- Use the MP Cable to connect the computer's RS232 port to the Modbus Plus Adapter, via a Unicom 2500 (or another RS485-to-RS232 converter).
- Set the DCE/DTE switch on the Unicom 2500 (or equivalent) to DCE.
- Turn the RS232 BAUD dial on the MP1 (or Unicom) to 19.2.
- Connect the 2-wire RS485 cable from the MP1 (or Unicom) and external power to the 5-wire connector (MP Cable) on the Modbus Plus Adapter, as shown in Appendix 4: Programming Connections.
- Set the baud rate in the terminal program to 19.2 kilobaud.

To enter Program mode:

- Slide the NORM/PROG switch to PROG.
- Unplug the 9V AC adapter and wait five seconds.
- Plug in the 9V AC adapter.
- Use Windows 95 HyperTerminal or another communications program to select local mode and a baud rate of 19.2 kilobaud.

Once you've finished programming, to reenter Normal mode:

- Slide the NORM/PROG switch to NORM.
- Replace the MP Cable (see Appendix 4: Programming Connections) with the 5-wire cable (see Appendix 5: Standard Connections).

Program-Mode Commands

Baud Rate

Use the following commands to read, program or erase the baud rate in the meter's flash.

- Erase Baud Rate
  - Type: BE[Enter]
  - B0 will be returned, indicating that the baud rate has been erased.
- Program Baud Rate
  - Type: BPrate[Enter], where rate is the baud rate (of up to five digits).
  - B0<CR> will be returned, indicating that the baud rate has been programmed.
- Read Baud Rate
  - Type: BR[Enter]
  - BRrate<CR> will be returned if a baud rate is in the flash, where rate is the baud rate (of up to five digits).
  - NA<CR> will be returned if the flash was not programmed with a baud rate.

Boot Software Version

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

Echo

The echo command is used to determine whether the Modbus Plus Adapter is responding correctly.

- Type: A[Enter]
- A<CR> will be returned if the Modbus Plus Adapter is responding correctly.

Global Registers

Use the following commands to read, program or erase the global registers in the meter's flash.

- Erase Global Registers
  - Type: GE[Enter]
  - G0 < CR > will be returned, indicating that the data has been erased.
- Program Global Registers
  - Type: GP02data[Enter], where data is a maximum of 162 characters, delimited by commas in groups of four. For example: GP02,1111,2222[Enter].
  - G0 < CR > will be returned, indicating that the data has been programmed.
- Read Global Registers
  - Type: GR[Enter]
  - GRrate < CR > data < CR > will be returned if flash has been programmed with global registers, where rate is the baud rate and data is the programmed data, delimited by commas in groups of four. For example: GR02 < CR > 1111,2222 < CR >.
  - NA < CR > will be returned if the flash was not programmed with data.

Meter Address

Use the following commands to read, program or erase the meter address in the meter's flash.

- Erase Meter Address
  - Type: ME[Enter]
  - M0 < CR > will be returned, indicating that the meter address has been erased.
- Program Meter Address
  - Type: MPaddress[Enter], where address is a maximum of three digits.
  - M0 < CR > will be returned, indicating that the meter address has been programmed.

- Read Meter Address

  - Type: MR[Enter]

  - MRaddress<CR>will be returned if a meter address is in the flash, where address is the meter address (of up to three digits).

  - NA<CR> will be returned if the flash was not programmed with a meter address.

Product Code

This command returns the product code assigned to the Modbus Plus Adapter.

- Type: E[Enter]

- Product code<CR> will be returned, where product code is the Modbus Plus Adapter's product code, "Modbus Plus Adapter."

Resetting the MP1

The Modbus Plus Adapter will automatically reset after five to ten minutes if no serial interrupt has occurred. To manually reset the MP1:

- Type: K[Enter]

- K<CR> will be returned, indicating that the Modbus Plus Adapter has been reset.

Appendix 1:
Command Summary

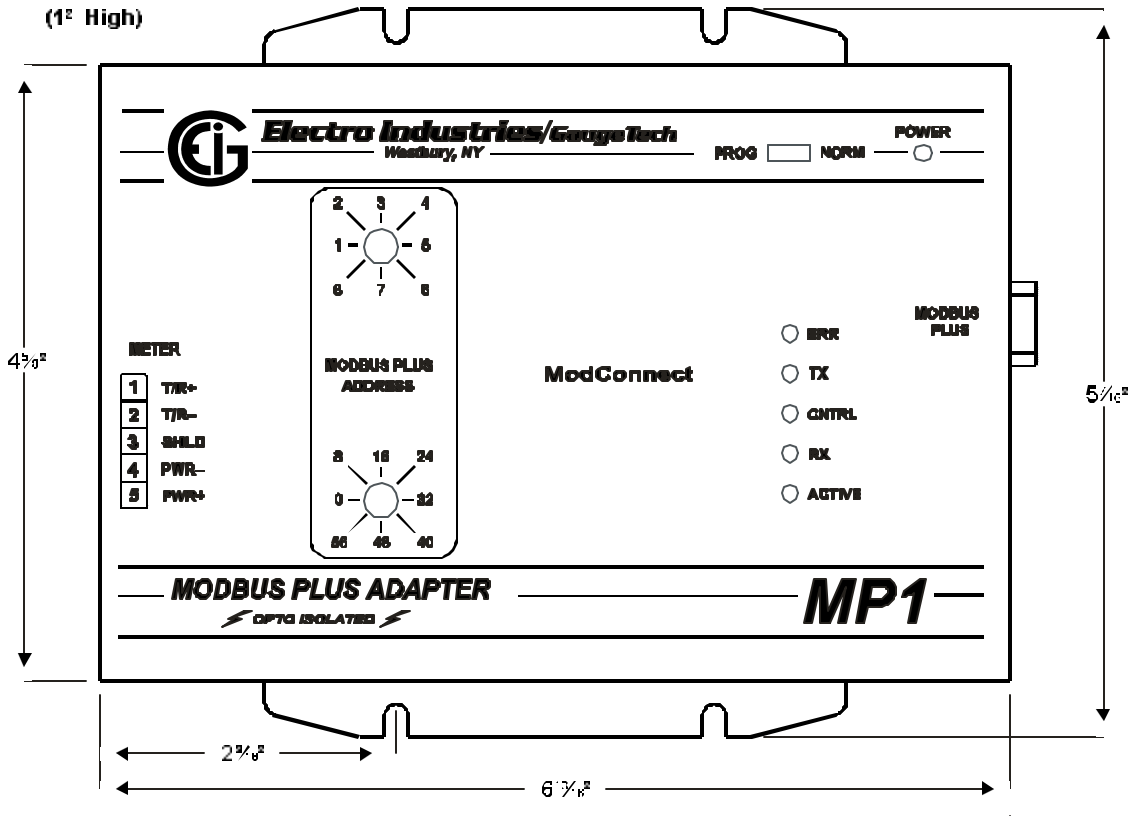
Description	Input	Output
Baud Rate: Erase	BE[Enter]	B0<CR> verifies that the baud rate has been erased
Baud Rate: Program	BPrate[Enter] rate= the baud rate (of up to five digits)	B0<CR> verifies that the baud rate has been programmed
Baud Rate: Read	BR[Enter]	BRrate<CR> rate=the programmed baud rate (of up to five digits) NA<CR> indicates no baud rate was programmed
Boot Software Version	Q[Enter]	Qn<CR> n=the three-digit version number of the MP1's boot software
Echo	A[Enter]	A<CR> verifies that the MP1 is responding properly
Global Registers: Erase	GE[Enter]	G0<CR> verifies that the data has been erased
Global Registers: Program	GP02data[Enter] data=up to 162 characters of data	G0<CR> verifies that the data has been programmed
Global Registers: Read	GR[Enter]	GRrate<CR>data<CR> rate=the programmed baud rate data=the programmed data NA<CR> indicates no data was programmed

Description	Input	Output
Meter Address: Erase	ME[Enter]	M0 < CR > verifies that the meter address has been erased
Meter Address: Program	MPaddress[Enter] address = meter address (of up to three digits)	M0 < CR > verifies that the meter address has been programmed
Meter Address: Read	MR[Enter]	MR[address] < CR > address = the programmed meter address (of up to three digits) NA < CR > indicates no meter address was programmed
Product Code: Read	E[Enter]	product code < CR > product code = the MP1's factory-assigned product code
Reset	K[Enter]	K < CR > verifies that the MP1 has been reset

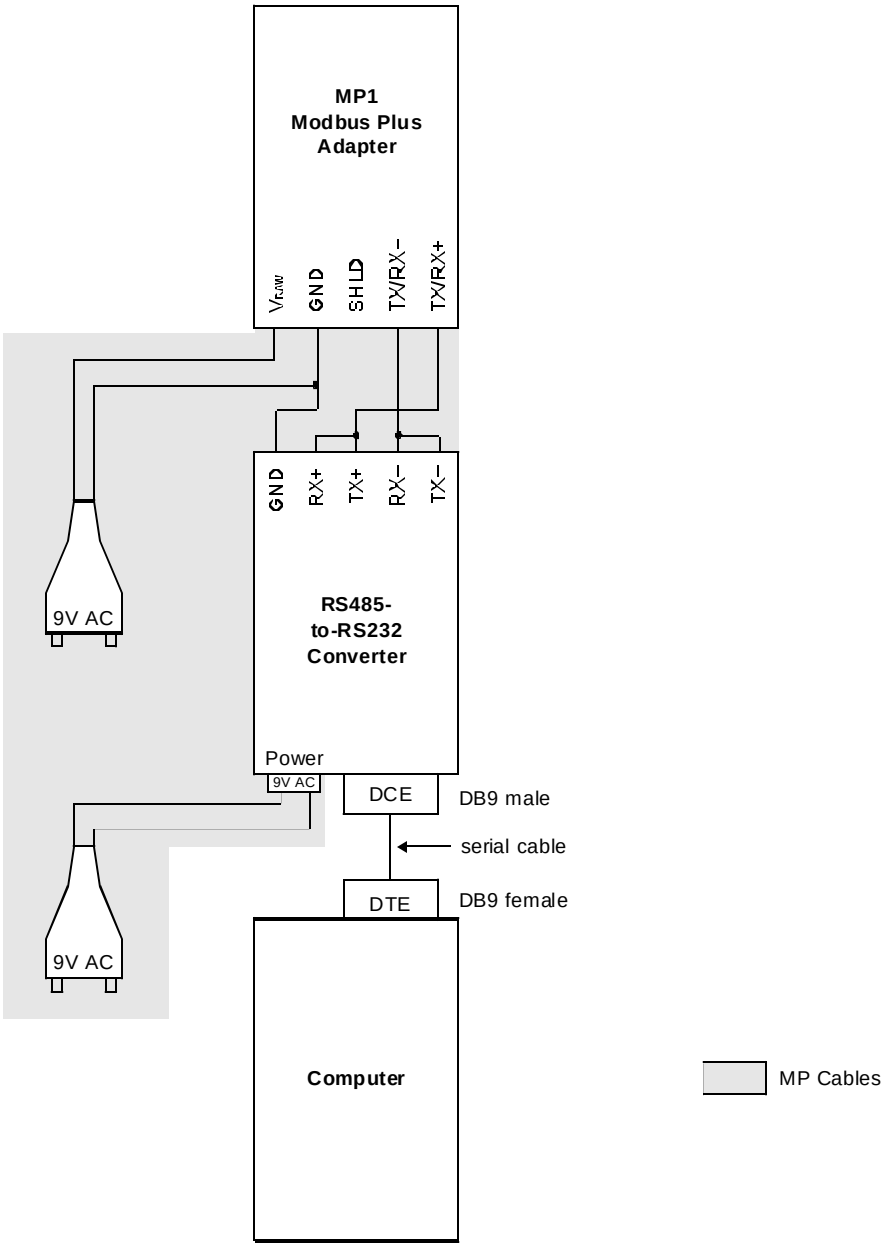
Appendix 2:
Specifications

Power Voltage Requirements	None (supplied by meter)
Maximum Power Consumption	3VA
Isolation Voltage	2500V RMS (RS485 to Modbus Plus)
Input Data Rate	300-57,600 baud
LED Indicators	POWER ERR (error) TX (transmit) CNTRL (control) RX (receive) ACTIVE (Modbus Plus)
Switches	Modbus Plus Address (two dials) PROG/NORM (program/normal selection)
Ports and Connectors	Modbus Plus (DB9 female) Power (RS485, 2-wire detachable terminal block)
Enclosure	Rugged aluminum, resistant to electromagnetic interference
Dimensions	Length: 6 13/16″ (169mm) Width: 4 5/8″ (117mm) Height: 1″ (27mm)
Mounting	Stand alone or wall mount (mounting plate supplied)
Operating Temperature	–20 to +70°C

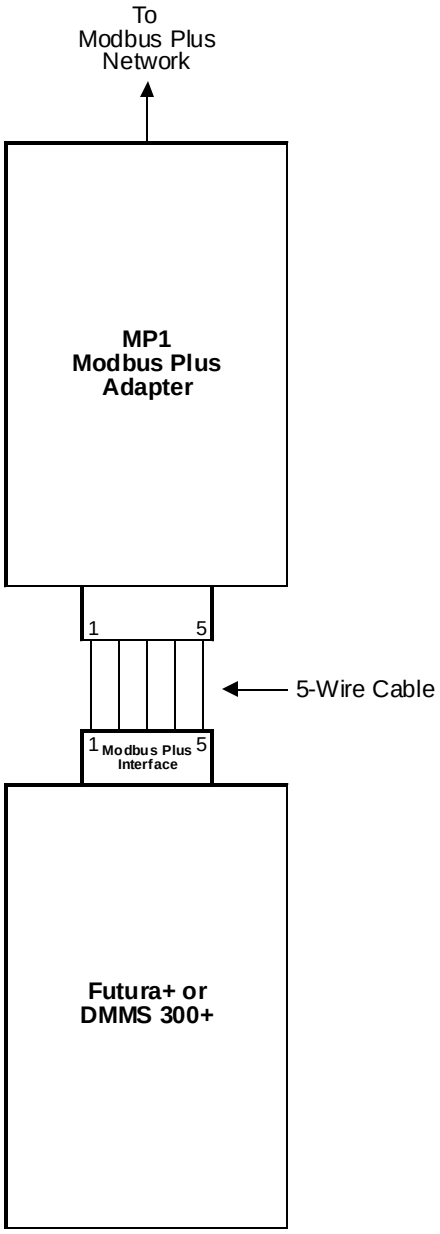
Appendix 3:
Mounting Information



Appendix 4:
Programming Connections



Appendix 5:
Standard Connections



5-Wire Connection
(end view of MP1
and monitor)