Landis+Gyr

Implementation of MODBUS Protocol

Document Number A-11736615

Revision B

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Document History

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Revision Level	Date Issued	Description of Revision
Original	1/16/97	Initial issue.
A	4/3/97	Addition of Protocol Converter board jumpers as requested by Scottish Power
B	5/15/97	Addition of Device Data Points Table

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Introduction

This implementation of the MODBUS® communication protocol in the QUAD4® Plus meter is based on the Modicon MODBUS Protocol Reference Guide, PI-MBUS-300 Rev. G, copyright 1994 by Modicon Inc. and on "Minimal Real-Time Device Implementation Notes." MODBUS is a registered trademark of Modicon, Inc.

This document details the implementation subset available in a QUAD4 Plus meter equipped with the optional Protocol Converter board. As a subset implementation, the QUAD4 Plus meter is not fully MODBUS compliant. Refer to the QUAD4 Plus and MAXsys Multifunction Electronic Meters and IEDs User's Guide (document number A-11736620) for additional information regarding the operation of the QUAD4 Plus meter.

Hardware

Communications interface	RS-232 (TX, RX, RTS, CTS, GND) or RS-485 (2-wire) (asynchronous mode)

Configurable Parameters

Slave address	0-247; address 0 (zero) = broadcast message.
Baud rate	300, 600, 1200, 2400, 4800, or 9600 (default is 9600)
Character	Size: 7 or 8 bits (default is 8) Stop bits: 1 or 2 (default is 1) Parity: Even, odd, or no (default is no)
Meter Data	All points (maximum of 16) to be returned are configured at the time the meter is formatted (defaults are based on meter firmware version)

Communication Mode

RTU mode communications are supported, as this is much more efficient in terms of the number of bytes to be transmitted.

Function Codes

The following MODBUS function codes are supported:

02	Read input status (read meter status)
03	Read holding registers (dump analog data)

In response to messages containing an unimplemented function code, the meter will return an exception response. Refer to the section below for details.

Point Numbering

Analog Points	Meter data is addressed as point 0 through 15.

Data Conversion

Data is stored in the meter as double precision floating point data. Analog values will be rounded and truncated at the decimal point and converted to a 16-bit two's complement integer.

Exception Responses

In response to an illegal function or data request, the high order bit of the function code is set. The function code is followed with an error code. The following error codes are supported:

01	Illegal function
02	Illegal data address
03	Illegal data value
04	Slave device failure

Device Data Points

A properly programmed unit equipped with a SuperBoard and the Protocol Converter board can upload a maximum of 16 points of data, either analog (instantaneous) or counters (rates). In addition, data is returned for up to 8 status input points.

A partial list of the data points:

Analog	Counters	Binary Inputs
Volts, Phase A	kWh delivered, 3 phase	Status input 1 Open/Close
Volts, Phase B	kVAh delivered, 3 phase	Status input 2 Open/Close
Volts, Phase C	kVarh delivered, 3 phase	Status input 3 Open/Close
Amps, Phase A	Watthours received, phase A, B, C	Status input 4 Open/Close
Amps, Phase B	Watthours delivered, phase A, B, C	Status input 5 Open/Close
Amps, Phase C	Received kWh	Status input 6 Open/Close
Amps, Neutral	Received kVAh	Status input 7 Open/Close
Per phase kW	Received kVarh	Status input 8 Open/Close
Per phase kVar	kvarh Quadrants 1 - 4	
Per phase kVA	kVAh Quadrants 1 - 4	
Per phase PF		
3 Phase kW		
3 Phase kVar		
3 Phase kVA		
3 Phase PF		

Jumper Positions on Protocol Converter Board

The following table provides the settings for all operational jumpers on the Protocol Converter board (second board from the front of the meter). You may have to remove the board from its slot to verify the jumpers if needed; if so, properly seat the board back in its slot. The highlighted text provides the factory settings for the jumpers in cases where two settings are available.

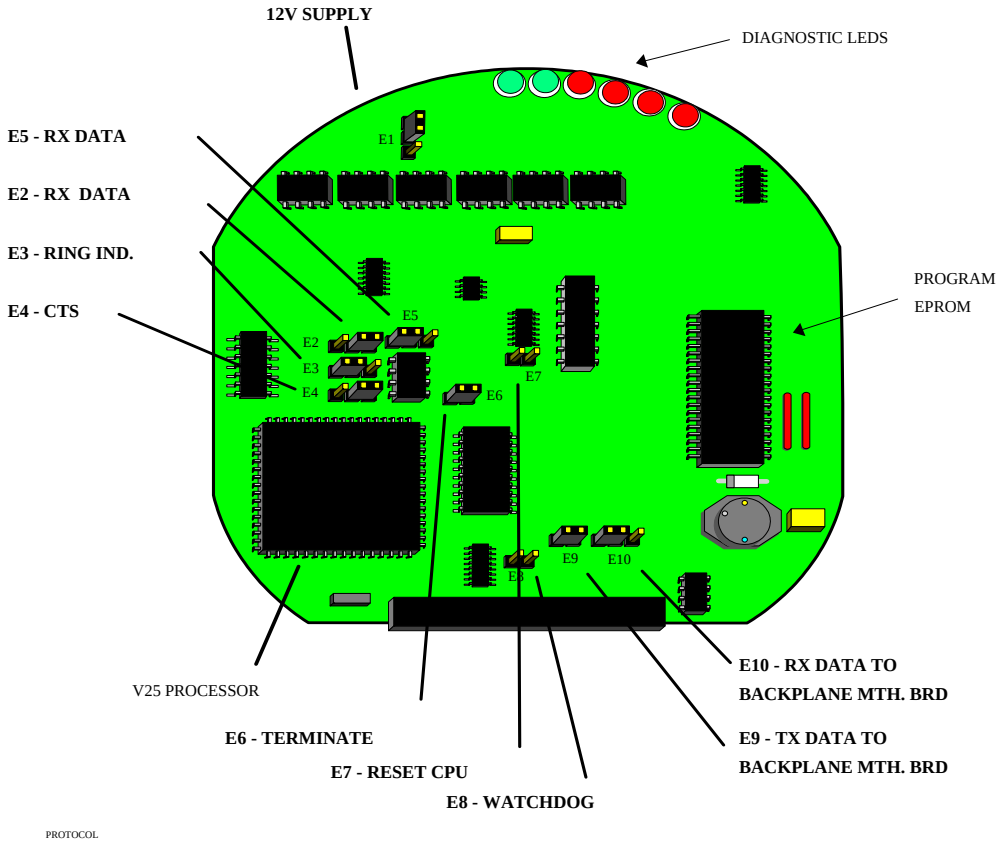
Host Serial Ports (connection from Protocol Board to host computer):

Port	Jumper	Position	Function
RS-232 (J2)	E2	A	RX data
	E3	A	Ring Indicate
	E4	A	CTS used
RS-485 (J2)	E2	B	RX data
	E5	A	RX data
	E6	In	Terminated
		Out	Unterminated (factory setting)
	E4	B	CTS not used

Meter Serial Port (connection from Protocol Board to CPU of meter):

Jumper	Position	Function
E9	In	TXD connected to backplane on Mother Bd. of meter.
E10	A	RXD connected to backplane (factory setting)
	B	RXD connected to RS-232

Figure 1: Protocol Converter Board



The following table provides the meanings of the Diagnostic LEDs across the top of the Protocol Converter board. From left to right, the LEDs are used for:

Two Leftmost LEDs	Blink during communication activity between Protocol Converter board and Host SCADA
Two middle LEDs	Blink during communication activity between Protocol Converter board and main meter processor on the SuperBoard
Fifth LED from left	Steady on means comm error to meter's main processor; off indicates no error
Sixth LED from left	Steady on means comm error to host SCADA system; off indicates no error