Know your energy

Modbus Register Map

EB – eTactica Power Bar

Revision history

Version	Action	Author	Date
1.0	Initial document	KP	25.08.2013
1.1	Document review, description and register update	GP	26.08.2013
1.2	Status bits, current noise floor	GP	29.08.2013
1.3	Using EG100 as a Modbus TCP/RTU bridge	GP	28.10.2013
1.4	Separate document for each device	GP	07.07.2014
1.5	Brand changed to eTactica, names of meters changed, the command register was updated.	ÁH	20.06.2016
2.0	EB300 additions, Power Sync Network	KP	1.02.2018

Introduction

All eTactica hardware devices are standard Modbus/RTU server devices, with a half-duplex RS485 serial interface.

This document covers the following products:

- EB-3xx: eTactica Power Bar, 3,6,12 point variants

The eTactica measurement devices implement a register table with both configurable and read-only parameters. These parameter values are accessible via standard Modbus requests. As the eTactica measurement devices are standard Modbus/RTU, you can use them with any standard Modbus infrastructure.

References

The Modbus protocol specification:
http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf

RS485 Serial Settings

All eTactica hardware devices have default settings for the RS485 serial interface:

- 19200 baud rate
- 8 data bits
- Even parity
- 1 stop bit

These settings configurable in devices with firmware version 3.2 or higher.

By default, the Modbus Unit ID is the last byte of the serial number, printed on each device. Eg, for a serial number of "00.04.A3.ED.2B.D1" the Unit ID is 0xD1, or 209 decimal. This can be changed via Modbus register 0x2009

Modbus Supported Functions

All eTactica hardware devices support the following Modbus function codes:

- 0x03 – Read Holding Registers
- 0x10 – Write Multiple Registers

Modbus Timing

Typically, the device will respond in 3-4 milliseconds. There is no limit on back to back requests.

Data Format and Addressing

Unless otherwise noted, each register value is an unsigned 16-bit integer. Signed values are regular 2's Complement Signed.

Data Encoding

According to the Modbus protocol specification the Big-Endian representation of both data and addresses is used. This means that the most significant byte (MSB) is sent first.

Addressing

The addresses used in this document are native register address. Not the register number, nor Modicon formatting with 30000/40000. For example, register 0x2000, the Vendor ID, could also be described as register 8192 (decimal) 8193 (decimal, register number) or 48192 (Modicon holding register format)

See these pages for more of an explanation:

- http://www.csimn.com/CSI_pages/Modbus101.html#mb101_reg1
- http://www.simplymodbus.ca/faq.htm#Map

The Register Map below lists the data addresses to use when forming the Modbus request (ADU message format) to each of the eTactica measurement devices.

Examples

Byte and Register ordering

As specified in Section 4.2 of the Modbus Application Protocol Specification, all values are stored in Big Endian, MSB first order. All register addresses in this document are "PDU Addresses" as per Section 4.4. In other words, the first register (Vendor ID) is accessed at register address 0 (plus the offset of 8192 (0x2000)). Note that some Modbus applications refer to this first register as "Modbus Data Model" register 1, which is then at address 0.

Values marked as 32bit, are *also* stored in Big Endian, MSB first, as would be implied by a sensible reading of section 4.2. 64 bit values are also stored Big Endian, MSB first.

Example 16bit value

Read a 16-bit value, Line frequency on EM-xxx, data address 0x200F.

PDU	
Function code	0x03
Starting address	0x200F
Quantity of registers	1
PDU message	0x03 – 0x20 – 0x0F – 0x00 – 0x01

Final Value	**Value Stored**	**Register high byte**	**Register low byte**
50.42 Hz	50420 (Register stores mHz)	0xC4	0xF4

Example 32bit value

Read a 32 bit value, Current on Channel 0 on ES-xxx or EB-xxx, data address 0x2016.

Register 0 = 0x2016, Register 1 = 0x2017

PDU	
Function code	0x03
Starting address	0x2016
Quantity of registers	2
PDU message	0x03 – 0x20 – 0x16 – 0x00 – 0x02

Final Value	**Value Store**	**Register 0 high**	**Register 0 low**	**Register 1 high**	**Register 1 low**
320.123 Amps	320123 (Value in mA) (0x4E27B)	0x00	0x04	0xe2	0x7b

Modbus Register Map

Common Registers

Below you find the registers, common to all eTactica measurement devices.

Register Address	R/W	Description
0x2000	R	Vendor id (0x524d)
0x2001	R	Product id
0x2002	R	Firmware version
0x2003	R	Serial number bytes 0..1
0x2004	R	Serial number bytes 2..3
0x2005	R	Serial number bytes 4..5
0x2006	R/W	**Command**
0x2007		Reserved
0x2008	R/W	**Serial communication settings**
0x2009	R/W	**Modbus slave ID**
0x200A		Reserved
0x200B		Reserved
0x200C		Reserved
0x200D		Reserved
0x200E	R	CPU Temperature in 0.01°C

Modbus Registers – EB Specific - Current Bar Region

An EB-3xx device operates as either a "Power Bar" or a "Current Bar" depending on whether suitable synchronization software is managing the modbus network. This section covers registers for the basic "Current Bar" mode. If you are using an EB standalone without an eTactica EM and EG to run the synchronization, this is the only mode available.

Note that for a 3 point device (i.e. EB-203), only the registers for breakers 0 through 2 are valid, and likewise for 6 and 9 point devices.

Current values are updated every 200 milliseconds.

Register Address	R/W	Size	Description
0x200F		1	Reserved
0x2010	R	1	total number of breakers
0x2011		1	Reserved
0x2012		1	Reserved
0x2013		1	Reserved
0x2014		1	CT ratio
0x2015		1	Reserved
0x2016	R	2	current breaker 0 (mA)
0x2018	R	2	current breaker 1 (mA)
0x201A	R	2	current breaker 2 (mA)
0x201C	R	2	current breaker 3 (mA)
0x201E	R	2	current breaker 4 (mA)
0x2020	R	2	current breaker 5 (mA)
0x2022	R	2	current breaker 6 (mA)
0x2024	R	2	current breaker 7 (mA)
0x2026	R	2	current breaker 8 (mA)
0x2028	R	2	current breaker 9 (mA)
0x202A	R	2	current breaker 10 (mA)
0x202C	R	2	current breaker 11 (mA)

Modbus Registers – EB Specific - Power Bar Region

When part of a Power Sync Network, the EB-3xx device will automatically be in Power Bar mode, as long as phase assignments have been written. See the section on Phase Assignment registers.

Current, phase, and active energy are updated every 200milliseconds. Sync variables are updated by the PowerSync Network, nominally every second.

Register Address	R/W	Size	Description
0x2100	R	1	CPU Temperature in 0.01°C
0x2101	R	1	Sync status
0x2102	R	2	Voltage Phase 1, from Sync, in mV
0x2104	R	2	Voltage Phase 2, from Sync, in mV
0x2106	R	2	Voltage Phase 3, from Sync, in mV
0x2108	R	1	Frequency from Sync, in mHz
0x2109	R	2	RMS Current breaker 0 (mA)
0x210B	R	1	Phase breaker 0 (±180°, in 0.01°)
0x210C	R	4	Active Energy Imported breaker 0 (in µWhrs)
0x2110	R	2	RMS Current breaker 1 (mA)
0x2112	R	1	Phase breaker 1 (±180°, in 0.01°)
0x2113	R	4	Active Energy Imported breaker 1 (in µWhrs)
0x2117	R	2	RMS Current breaker 2 (mA)
0x2119	R	1	Phase breaker 2 (±180°, in 0.01°)
0x211A	R	4	Active Energy Imported breaker 2 (in µWhrs)
0x211E	R	2	RMS Current breaker 3 (mA)
0x2120	R	1	Phase breaker 3 (±180°, in 0.01°)
0x2121	R	4	Active Energy Imported breaker 3 (in µWhrs)
0x2125	R	2	RMS Current breaker 4 (mA)
0x2127	R	1	Phase breaker 4 (±180°, in 0.01°)
0x2128	R	4	Active Energy Imported breaker 4 (in µWhrs)
0x212C	R	2	RMS Current breaker 5 (mA)
0x212E	R	1	Phase breaker 5 (±180°, in 0.01°)
0x212F	R	4	Active Energy Imported breaker 5 (in µWhrs)
0x2133	R	2	RMS Current breaker 6 (mA)
0x2135	R	1	Phase breaker 6 (±180°, in 0.01°)
0x2136	R	4	Active Energy Imported breaker 6 (in µWhrs)
0x213A	R	2	RMS Current breaker 7 (mA)
0x213C	R	1	Phase breaker 7 (±180°, in 0.01°)
0x213D	R	4	Active Energy Imported breaker 7 (in µWhrs)
0x2141	R	2	RMS Current breaker 8 (mA)
0x2143	R	1	Phase breaker 8 (±180°, in 0.01°)
0x2144	R	4	Active Energy Imported breaker 8 (in µWhrs)
0x2148	R	2	RMS Current breaker 9 (mA)
0x214A	R	1	Phase breaker 9 (±180°, in 0.01°)
0x214B	R	4	Active Energy Imported breaker 9 (in µWhrs)
0x214F	R	2	RMS Current breaker 10 (mA)

0x2151	R	1	Phase breaker 10 (±180°, in 0.01°)
0x2152	R	4	Active Energy Imported breaker 10 (in µWhrs)
0x2156	R	2	RMS Current breaker 11 (mA)
0x2158	R	1	Phase breaker 11 (±180°, in 0.01°)
0x2159	R	4	Active Energy Imported breaker 11 (in µWhrs)

Modbus Registers – EB Specific - Energy registers

Full quadrant energy registers are maintained for both active and reactive energy, import and export. These are full 64bit upcounters, and all writeable. You need to use register 0x2006, the command register to save changes back to EEPROM.

Register Address	Size	Description
0x2200	4	Active Energy Imported, breaker 0 (µWhr)
0x2204	4	Active Energy Imported, breaker 1 (µWhr)
0x2208	4	Active Energy Imported, breaker 2 (µWhr)
0x220C	4	Active Energy Imported, breaker 3 (µWhr)
0x2210	4	Active Energy Imported, breaker 4 (µWhr)
0x2214	4	Active Energy Imported, breaker 5 (µWhr)
0x2218	4	Active Energy Imported, breaker 6 (µWhr)
0x221C	4	Active Energy Imported, breaker 7 (µWhr)
0x2220	4	Active Energy Imported, breaker 8 (µWhr)
0x2224	4	Active Energy Imported, breaker 9 (µWhr)
0x2228	4	Active Energy Imported, breaker 10 (µWhr)
0x222C	4	Active Energy Imported, breaker 11 (µWhr)
0x2230	4	Active Energy Exported, breaker 0 (µWhr)
0x2234	4	Active Energy Exported, breaker 1 (µWhr)
0x2238	4	Active Energy Exported, breaker 2 (µWhr)
0x223C	4	Active Energy Exported, breaker 3 (µWhr)
0x2240	4	Active Energy Exported, breaker 4 (µWhr)
0x2244	4	Active Energy Exported, breaker 5 (µWhr)
0x2248	4	Active Energy Exported, breaker 6 (µWhr)
0x224C	4	Active Energy Exported, breaker 7 (µWhr)
0x2250	4	Active Energy Exported, breaker 8 (µWhr)
0x2254	4	Active Energy Exported, breaker 9 (µWhr)
0x2258	4	Active Energy Exported, breaker 10 (µWhr)
0x225C	4	Active Energy Exported, breaker 11 (µWhr)
0x2260	4	Reactive Energy Import, breaker 0 (µVAhr)
0x2264	4	Reactive Energy Import, breaker 1 (µVAhr)
0x2268	4	Reactive Energy Import, breaker 2 (µVAhr)
0x226C	4	Reactive Energy Import, breaker 3 (µVAhr)
0x2270	4	Reactive Energy Import, breaker 4 (µVAhr)
0x2274	4	Reactive Energy Import, breaker 5 (µVAhr)
0x2278	4	Reactive Energy Import, breaker 6 (µVAhr)
0x227C	4	Reactive Energy Import, breaker 7 (µVAhr)
0x2280	4	Reactive Energy Import, breaker 8 (µVAhr)

0x2284	4	Reactive Energy Import, breaker 9 (µVAhr)
0x2288	4	Reactive Energy Import, breaker 10 (µVAhr)
0x228C	4	Reactive Energy Import, breaker 11 (µVAhr)
0x2290	4	Reactive Energy Export, breaker 0 (µVAhr)
0x2294	4	Reactive Energy Export, breaker 1 (µVAhr)
0x2298	4	Reactive Energy Export, breaker 2 (µVAhr)
0x229C	4	Reactive Energy Export, breaker 3 (µVAhr)
0x22A0	4	Reactive Energy Export, breaker 4 (µVAhr)
0x22A4	4	Reactive Energy Export, breaker 5 (µVAhr)
0x22A8	4	Reactive Energy Export, breaker 6 (µVAhr)
0x22AC	4	Reactive Energy Export, breaker 7 (µVAhr)
0x22B0	4	Reactive Energy Export, breaker 8 (µVAhr)
0x22B4	4	Reactive Energy Export, breaker 9 (µVAhr)
0x22B8	4	Reactive Energy Export, breaker 10 (µVAhr)
0x22BC	4	Reactive Energy Export, breaker 11 (µVAhr)

Modbus Registers – EB Specific - Phase Assignments

The Power Bar cannot calculate phase angle (and hence power) until it has been configured which phases are on which breaker points. After writing to these registers, you should save your configuration using register 0x2006.

Valid phase assignments

Phase	Register value
L1 / A	0
L2 / B	1
L3 / C	2
Unassigned	All other values, nominally 0xFFFF

Register Address	R/W	Size	Description
0x3000	R/W	1	Phase assignment breaker 0
0x3001	R/W	1	Phase assignment breaker 1
0x3002	R/W	1	Phase assignment breaker 2
0x3003	R/W	1	Phase assignment breaker 3
0x3004	R/W	1	Phase assignment breaker 4
0x3005	R/W	1	Phase assignment breaker 5
0x3006	R/W	1	Phase assignment breaker 6
0x3007	R/W	1	Phase assignment breaker 7
0x3008	R/W	1	Phase assignment breaker 8
0x3009	R/W	1	Phase assignment breaker 9
0x300A	R/W	1	Phase assignment breaker 10
0x300B	R/W	1	Phase assignment breaker 11

Detailed Register Descriptions

Register 0x2006 – Command

The command register is a 16 bit value. You use this register to permanently store new configuration settings in EEPROM or reload factory default. The meaning of each bit and bit combination is described in the table below.

Bit #	Description
15	Reserved
14..6	unused
5	"Frequency mode", Enable this bit to have a 60 Hz digital filter, or leave it at 0 to keep the 50 Hz digital filter.(just for EB and ES with firmware version 3.14 or higher.)
4	Reserved
3	LED Control State (1 == LED on, 0 == LED off)
2	LED Control State Valid (1 == bit 3 is valid, 0 == bit 3 is ignored)
1	Enable this bit to reload default device configuration to RAM (use in conjunction with bit 0 to reset EEPROM to factory defaults)
0	Enable this bit to store current configuration to EEPROM and restart device

Register 0x2008 - Serial communication settings

The serial communication register is a 16 bit value. It allows you to edit the protocol settings for the RS485 serial interface. Take care modifying these settings. It can be tedious to rediscover what the settings are, for an unknown device.

Default settings for all devices is: 19200 - 8 - Even - 1

Firmware Limitation

The editable feature is only available for devices with firmware version 3.2 or above.

After writing a value to this register, you must write to the **Command** register (0x2006) to store settings in EEPROM and reinitialize the device. This will make the new settings take effect.

Bit #	Description
15..12	Stop Bits (normally 1, 2 is also allowed) 0001 (0x01) : 1 stop bit 0010 (0x02) : 2 stop bits
11..8	Parity (0: None, 1: Odd, 2: Even) 0000 (0x00) : Parity none 0001 (0x01) : Parity odd 0010 (0x02) : Parity even
7..0	Baud rate value (See table below)

Baud Rate Table

Values to write as the lowest byte in this register that represent pre-defined baud rates.

Lowest Byte of 0x2008	Baud Rate
0000 (0x00)	default (19200 at present)
0001 (0x01)	600
0010 (0x02)	1200
0011 (0x03)	2400
0100 (0x04)	4800
0101 (0x05)	9600
0110 (0x06)	19200
0111 (0x07)	38400
1000 (0x08)	57600
1001 (0x09)	115200

Examples

Contents of register 0x2008	Description
0x1200	Factory Default, 1 Stop bit, Even Parity, Default Baud Rate (19200)
0x1005	1 Stop Bit, No Parity, 9600 Baud
0x1209	1 Stop Bit, Even Parity, 115200 Baud
0x1101	1 Stop bit, Odd Parity, 600 Baud
0x0044	Don't do this! (Unexpected values will be converted to 1 Stop bit, No Parity, 115200)

Register 0x2009 - Modbus slave ID

The Modbus slave ID register, is a 16 bit value. It is a configurable register where you can modify the default slave ID for your device. Only the lower byte for this 16 bit value is valid for the slave ID. Take care to preserve the upper byte as is.

According to the Modbus protocol, it is only allowed to use addresses from 1 - 247.

Bit #	Description
15..8	Reserved, do not modify contents
7..0	Modbus slave ID (values from 1 to 247)