

Raritan EMX Modbus Interface

Introduction

The EMX device can act as a Modbus/TCP server. The Modbus service can be enabled in the Network Services section of the Device Settings menu in the web UI.

Supported Modbus Functions

The following Modbus function codes are supported:

- General Commands:
 - Read Device Identification (2Bh)
- 16-bit Word Access:
 - Read Holding Registers (03h)
 - Write Single Register (06h)
 - Write Multiple Registers (10h)

Feature Set

The following features of the EMX are available via Modbus:

- Peripheral sensor readings
- Peripheral actuator control

Register Layout

Conventions

- All register or coil addresses are hexadecimal, indicated by a `h` suffix.
- Data types which span multiple 16-bit registers are big-endian, i.e. the lowest register address contains the most significant bits.
- The following data types are supported for holding registers:
 - Word: 16-bit unsigned integer
 - DWord: 32-bit unsigned integer (two registers, big-endian)
 - QWord: 64-bit unsigned integer (four registers, big-endian)
 - Float: IEEE 32-bit floating point value (two registers, big-endian)
 - Bit Mask: 16 individual bits
- The access flags column can have the following values:
 - R: Read-only register
 - W: Write-only register (writing triggers an action, always reads 0)
 - R/W: Read-write register
- Reading a reserved register usually yields zero, but the meaning may change in future versions.
- Reserved bits in bit mask registers should always be written as 0.

Register Addresses and Numbers

The Modbus standard supports up to 65536 entities of each register type (input registers, holding register, coils, etc.). Entity addresses range from 0 to 65535 decimal (`FFFFh` hexadecimal). All register addresses listed in this document refer to these entity addresses.

Some Modbus software uses a 5- or 6-digit entity *number* convention where the first digit indicates the entity type:

Type	First Digit	5-Digit Numbers	6-Digit Numbers
Coil	0	00001 - 09999	000001 - 065536
Discrete Input	1	10001 - 19999	100001 - 165536
Input Register	3	30001 - 39999	300001 - 365536
Holding Register	4	40001 - 49999	400001 - 465536

To convert a holding register address from this document to a 5- or 6-digit register number, add 40001 or 400001 to the decimal value of the address.

Holding Register Map

Start	End	Function	See Section
0000h	0010h	Basic EMX parameters	Basic EMX Parameters
...			
1000h	100Fh	Peripheral sensor 1	Peripheral Sensors
1010h	101Fh	Peripheral sensor 2	

...			
1810h	181Fh	Peripheral sensor 130	

Basic EMX Parameters

Address	Type	Access	Parameter
0000h	Word	R	Register set version (8 bit major, 8 bit minor)

Peripheral Sensors

Up to 130 peripheral sensors are supported. Each sensor occupies a block of 16 holding registers. The base address of a sensor's register block is determined by the following formula, with i being a sensor number between 0 and 129:

$$\text{base address} = 1000\text{h} + i * 10\text{h}$$

The full register address is determined by adding the offset from the table below to this base address. For example the reading of the third peripheral sensor ($i = 2$) is in register:

$$\begin{aligned} \text{register address} &= \text{base address} + \text{offset} \\ &= 1000\text{h} + 2 * 10\text{h} + 02\text{h} \\ &= 1022\text{h} \text{ (or 4130 decimal)} \end{aligned}$$

Offset	Type	Access	Parameter
00h	Word	R	Sensor type: <ul style="list-style-type: none"> • 0: unassigned • 1: Temperature in °C • 2: Relative humidity in % • 3: Air flow in m/s • 4: Air pressure in Pa • 5: Contact closure (0: off, 1: on) • 6: Vibration in G • 7: Water leak (0: normal, 1: alarm) • 8: Smoke detector (0: normal, 1: alarm) • 9: Ambient light in lux • 10: Dry contact (actuator, 0: off, 1: on) • 11: Magnetic contact (0: off, 1: on) • 12: Passive IR motion detector (0: off, 1: on) • 13: Tamper detector (0: normal, 1: alarm) • 14: Powered dry contact (actuator, 0: off, 1: on) • 15: Absolute humidity in g/m³ • 16: Acceleration in G • 17: Door state (0: open, 1: closed) • 18: Door lock state (0: open, 1: closed) • 19: Door handle lock switch (0: open, 1: closed)
01h	Word	R	State (for discrete sensors)
02h - 03h	Float	R	Sensor reading (for numerical sensors, see above for unit)
04h	Word	R/W	Actuator control
05h - 0Fh			Reserved