

# 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	<a href="#">Basic EMX Parameters</a>
...			
1000h	100Fh	Peripheral sensor 1	<a href="#">Peripheral Sensors</a>
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"> <li>• 0: unassigned</li> <li>• 1: Temperature in °C</li> <li>• 2: Relative humidity in %</li> <li>• 3: Air flow in m/s</li> <li>• 4: Air pressure in Pa</li> <li>• 5: Contact closure (0: off, 1: on)</li> <li>• 6: Vibration in G</li> <li>• 7: Water leak (0: normal, 1: alarm)</li> <li>• 8: Smoke detector (0: normal, 1: alarm)</li> <li>• 9: Ambient light in lux</li> <li>• 10: Dry contact (actuator, 0: off, 1: on)</li> <li>• 11: Magnetic contact (0: off, 1: on)</li> <li>• 12: Passive IR motion detector (0: off, 1: on)</li> <li>• 13: Tamper detector (0: normal, 1: alarm)</li> <li>• 14: Powered dry contact (actuator, 0: off, 1: on)</li> <li>• 15: Absolute humidity in g/m<sup>3</sup></li> <li>• 16: Acceleration in G</li> <li>• 17: Door state (0: open, 1: closed)</li> <li>• 18: Door lock state (0: open, 1: closed)</li> <li>• 19: Door handle lock switch (0: open, 1: closed)</li> </ul>
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