HORIZONE SERVER

IN00B02WEB

MODBUS MODULE MANUAL

Product: IN00B02WEB
Description: Horizone Server Modbus Module Manual
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Any information in this manual may be changed without notice.

This manual can be downloaded free of charge from the website: *www.eelectron.com*

Exclusion of responsibility:
Although the contents of this manual have been checked to ensure that they correspond to the hardware and software indicated in the title, changes may, however, be made. Consequently, Eelectron assumes no responsibility therein.

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Summary

INTRODUCTION

Safety Information

This manual contains the information necessary to safely operate the device. Anyone interacting with the device must first have read this documentation, especially this safety information. This document supplements and does not replace any safety laws or directives.

The device has been developed using state-of-the-art technologies and following current safety regulations; it is, however, not possible to totally exclude all possible damage or interaction with other devices during its operation. The device complies with EMC guidelines and harmonised European standards; any changes to the device may affect EMC compatibility.

The supply voltage must be strictly within the range indicated in this manual and on the device; danger of fire or explosion if power is supplied outside this range. The equipment shall be powered by a limited power supply circuit whose isolation from the mains shall be not less than that between the primary and secondary circuits of a safety transformer according to IEC 61558-2-6 or equivalent.

The CE declaration of conformity of the device can be requested from Eelectron SpA, at the contacts on the website www.eelectron.com

In accordance with Directive 2002/96/EC, electronic devices must be disposed of in dedicated facilities and not in the collection of municipal solid waste.

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INTRODUCTION

Introduction

HORIZONE can use the Modbus RTU and Modbus TCP/IP protocol to supervise one or more slave devices, connected via both RS485 and network connection.

Once communication logs are configured with a Modbus slave device, they can be managed as objects on the supervision pages or associated with other objects using logic.

Purpose of this document

This manual contains all the information you need to install, configure and use the specific features of Modbus technology in the HORIZONE SERVER. It is aimed primarily at installers, but can also be a useful guide for end users who are interested in customising the supervision features of their building automation system.

It assumes a good knowledge of the Modbus protocol, the related devices to be supervised and controlled on the system and HORIZONE; many sections of this document refer to general concepts of supervision that can be explored in the general product INSTALLATION MANUAL.

For more information on the Modbus protocol, please consult the following page:

http://www.modbus.org/tech.php

Requirements

You must have the following in order to manage an integration of Modbus devices with HORIZONE:

- A HORIZONE SERVER
- MODBUS module activation license

To enter the activation license:

- Log on to HORIZONE SERVER administration
- Select “SETUP” from the side menu, then “MANAGE MODULES AND LICENSES”
- Identify “ACCESS CONTROL” and enter the activation code

- Press the “SAVE” button and wait for the page to reload

Refer to the INSTALLATION MANUAL for further details.

CONNECTION

Modbus RTU

To manage a device operating with MODBUS RTU protocol, simply connect it to the RS485 port integrated into HORIZONE SERVER, respecting the polarity indicated on both the webserver and the device.

Alternatively, you can use the RS232 port or one of the USB ports, using an RS485 adapter.

Modbus TCP

Interfacing with a device operating on MODBUS TCP protocol requires it be connected to the same LAN as the webserver and for the two to be able to dialogue on the communication port of the protocol, typically port 502.

Preliminary operations

Before starting the configuration of a Modbus device in HORIZONE SERVER, it is necessary to obtain the table (or “mapping”) of the read and/or write logs. You will be able to identify the useful information in it to make the HORIZONE communicate with the device, including the fundamental information you need to know before proceeding with the integration:

COMMUNICATION PARAMETERS	They vary depending on the type of protocol used by the Modbus device. In the case of Modbus RTU, the entries are as follows: - Baud rate - Parity - Data bit - Stop bit - Communication mode (RS232 or RS485) With the Modbus TCP, you need to know: - IP Address - Port
SLAVE ADDRESS	Each Modbus peripheral, whether communicating via RTU or TCP, has a unique address on the network. Unless the manufacturer specifies it, you can change it. The procedure to follow is specified in the manual and is usually performed through pre-configuration software of the device or via hardware with dedicated switches. Eligible addresses on a Modbus network range from 1 to 247. The Master device of the line, which in our case will always be HORIZONE, does not need an address for communication while address 0 is reserved for “broadcast” messages

FUNCTIONS	In the Modbus, the “Function” entry indicates the second byte of a message. It is sent by the Master and indicates which table of Slave logs must be entered to access the data and whether a read or a write operation should be performed. Read functions: FC 01: Read coil status FC 02: Read input status FC 03: Read holding register FC 04: Read input registers Write functions: FC 05: Force single coil FC 06: Preset single register FC 15: Force multiple coils FC 16: Preset multiple registers It is essential to know each device registry on the network with which Modbus function must be written and read in order to access the correct data; as with other information, this is also contained in the device manuals.
REGISTERS	A register contains the data to be read and/or written with HORIZONE. Each device has a mapping that identifies each register and declares its contents: a register, for example, may contain a temperature value, an on/off command or an alarm signal. As you can see below, the logs will be the “objects” available to the user on the supervision page in order to interact with the device through the Modbus, whether they are read, write or both. Since they are HORIZONE objects, they can be used for each of the server functions: schedules, logics, conditions, composite objects, etc. For more information, consult the HORIZONE configuration manual.

DATA TYPES	Indicates the set of values for each register that the variable can assume and the operations that can be performed on it. For example, you can only perform simple arithmetic operations on integers on an integer log (INT). The device logs table also mainly shows the type of encoding needed to interpret the value.

Once you have obtained all of the above information about the Modbus device, it is recommended that you test write and read with Modbus software from your PC. This step allows you to get in-depth information about the device function by performing a test bench before proceeding with integration with HORIZONE.

All you need to do is install the Modbus Master software on your PC and connect it with a serial cable or network cable to the device, depending on whether the protocol is Modbus RTU or TCP, in order to access the device and its registers. This will allow you to test all the key aspects that will allow integration: communication parameters, addresses, functions, registers and data types. Once you have succeeded in interacting with the Modbus device, resolving any problems encountered, integration on HORIZONE will be easier and faster.

Obviously, this procedure must be followed for each device that you want to insert into a HORIZONE line.

You can find lots of free Modbus Master programs on the internet; we recommend the following:

http://www.modbustools.com/modbus_poll.html (30 days free trial)

https://oceancontrols.com.au/OCS-011.html

http://www.qmodbus.sourceforge.net/

After obtaining all the information required to integrate one or more Modbus devices with the HORIZONE and performing the communication, write and read tests, you can proceed to create the HORIZONE registers.

MODBUS LINES

Introduction

HORIZONE potentially supports more than one Modbus interface, through the creation of the same number of Modbus lines on different communication channels; these lines can operate simultaneously, provided they are properly configured on the communication interfaces available in HORIZONE:

- RS485
- RS232
- USB
- Network

For each line, it is possible to create a number of objects (similar to Modbus registers), belonging to the different devices connected to it, which can then be entered in the supervision graphics pages.

It is also possible to manage more than one slave device if connected in a “cascade” to the same RS485 line, thus creating only one line in HORIZONE and differentiating devices through the slave address, as further detailed below. In this case, all devices must operate with the same communication parameters (BAUD rate, parity, etc.)

It is essential to create only one bus line for each HORIZONE communication port; otherwise, communication conflicts will occur.

New Modbus line

Proceed as follows to create a new Modbus line:

- Log on to HORIZONE administration
- Open the “TECHNOLOGIES” section of the side menu
- Select “Modbus” and expand the “Modbus Lines” entry
- Press the “ADD” button in the toolbar below (“+” symbol)

A new bus line is created and added to the list; at this point, by clicking on it and selecting the “three dots” on the right (or, alternatively, after selecting it, pressing the “EDIT” button in the toolbar), you access then its configuration page.

In the “GENERAL SETTINGS” section, the following parameters are available, varying depending on whether the “Communication” entry is set as Serial/USB or Network:

NAME	Modbus Line identifier label
COMMUNICATIONS	Allows the Modbus communication protocol, choosing from: ● Serial/USB ● Network
DEBUG	There are two entries in the Debug field: ● None ● Log File By selecting “Log file”, all the events that affect the Modbus line, both in transmission and in reception, with related errors, line settings and other information will be written to a file, which can be downloaded with the “Download Log” button. This tool can be useful during the commissioning of Modbus devices with HORIZONE but, once the system is operational, it **is recommended to activate it only if strictly necessary** (e.g. maintenance or software modifications). The “Clear Log” button clears all content written to the log file by deleting all previously logged messages and reducing their size.
ENABLE MONITOR BUS	Selecting this option stores all modbus traffic in a temporary file, which can be accessed via the MONITOR BUS button (only available if this option is enabled).

The following parameters must be entered for serial communication:

SERIAL PORT	Determines which communication channel HORIZONE will use to connect to the Modbus devices connected. You can use any of the serial ports of the HORIZONE: ● External RS232 port ● USB port 1 ● USB port 2 When connecting to HORIZONE USB ports, a USB-serial adapter must be provided.
BAUD RATE	Sets the Modbus channel communication rate in bits/s. The speed must be the same as the speed of the devices connected to the HORIZONE server: ● 1200 ● 2400 ● 4800 ● 9600 ● 19200 ● 38400 ● 57600 ● 115200
PARITY	Modbus line communication parameter to be selected based on the one set on the devices with which communication is to take place: ● EVEN ● ODD ● NONE
STATUS BIT	Modbus line communication parameter to be selected based on the one set on the devices with which communication is to take place

STOP BIT	Modbus line communication parameter to be selected based on the one set on the devices with which communication is to take place
COMMUNICATION METHOD	Set RS485 for natively devices operating in RTU mode, vice versa use RS232 mode for converters or other similar types of serial communication interfaces

Conversely, in the case of network communication:

IP ADDRESS	IP address of the Modbus device.
PORT	Communication port used by the Modbus device.

The “Execution status” entry tells the user the status of the Modbus line: “running (continuous) if there is communication, “Stopped” if there is no packet transmission and reception.

There are two buttons to intervene on line communication: “START” and “STOP” that respectively allow you to start or stop communication with the Modbus line.

There are also three other buttons available: “CLOSE”, which simply closes the open Modbus line page, “DOWNLOAD LOG” and “CLEAR LOG”.

The “DOWNLOAD LOG” and “CLEAR LOG” buttons appear only if the Debug entry has been enabled in the properties. By pressing the “DOWNLOAD LOG" button, the browser will start downloading the file containing all the events that will affect the Modbus line, both in transmission and reception, with related errors, line settings and other useful information.

The “CLEAR LOG” button clears the contents of the Log file by deleting all previously logged messages and reducing the size.

The “Enable Communication” flag, if not selected, allows you to maintain the configuration of a bus line within the project, but make communication inert.

MODBUS REGISTERS

Creation of registers

To create one or more registers for each slave connected to the HORIZONE Modbus line:

- Access the Modbus Line
- Type the number of registers to create in the text field next to the “ADD” button under the section title “MODBUS REGISTERS”
- Press the ADD button

As many new registers as required are automatically created.

Once created, the registers can be renamed simply by typing the new name in the appropriate text box; You can also access the register detail tab, through the corresponding edit button; the “DELETE” button vice versa removes (permanently) the register from the project.

For each register, you can set the following properties:

NAME	Label used within the supervision to identify the Modbus Slave register. E.g. “outdoor temperature”, “living room light” etc.
SLAVE	Address of the Slave device to which the register belongs.
REGISTER	Register address.
TYPE	Determines the type of data contained in the register: ● Boolean (ON/OFF) ● Numeric - rational (with comma) ● Numeric - integer (no comma values) Note: we recommend using integer encoding if you do not expect comma values to be handled.
READABLE	Flag to enable if the register can be read.

READ	If the register is readable, determine which Function to query with: ● Read Coil Status (FC1) ● Read Input Register (FC2) ● Read Holding Registers (FC3) ● Read Input Registers (FC4)
WRITABLE	Flags to enable if the log is writable.
WRITE	If the register is in write, choose the appropriate Function to run it: ● FC05 (Force Single Coil) ● Preset Single Register (FC06) ● Force Multiple Coils (FC15) ● Preset Multiple Registers (FC16)
R/W	Allows you to determine the number of registers to be read and/or written simultaneously. For further details, please refer to the appropriate section below

<table>
<tr>
<td>ENCODING</td>
<td>Determines the type of encoding to be used for interpreting the data within the register. The following encodings are supported:
<table>
<tr><td>Unsigned Integer

Unsigned integer</td><td>1 register (2 bytes)</td></tr>
<tr><td>Signed Integer

Signed integer</td><td>1 register (2 bytes)</td></tr>
<tr><td>Unsigned long

Unsigned Long</td><td>2 registers (2 bytes) *</td></tr>
<tr><td>Signed Long

Signed long</td><td>2 registers (4 bytes) *</td></tr>
<tr><td>Signed long inverted

Signed long inverted

Note: the order of the two registers is reversed with respect to the “long” encoding</td><td>2 registers (4 bytes) *</td></tr>
<tr><td>Floating point</td><td>2 registers (4 bytes) *</td></tr>
<tr><td>Inverted floating point

Note: the order of the two registers is reversed with respect to the "floating point" encoding</td><td>2 registers (4 bytes) *</td></tr>
<tr><td>Bit mask

Bit mask</td><td>1 register (2 bytes)</td></tr>
</table>
</td>
</tr>
</table>

Signed double *Signed double*	4 registers (8 bytes)
Unsigned double *Unsigned double*	4 registers (8 bytes)

(*) in order to be selected, 4-byte encodings require the R/W field be set to "2" beforehand, since two registers must be read/written together. Similarly, the field must be set to 4 for 8-byte encodings.

BIT	This entry is available only if the register on which you write and read is encoded as Bit Mask. This encoding is used where each individual bit has a precise meaning (e.g. a one-byte register where each individual bit is an on/off output of an 8-channel actuator). The Bit entry then determines on which bit within the mask the read and/or write operation will be performed.
MULTIPLIER	The contents of the register are multiplied by the value set in this field. E.g. register (temperature): 235; multiplier: 10; value on HORIZON: 235x10 = 23.5
OFFSET	Allows you to add a fixed value to the value read by the device. E.g. register (temperature): 235; multiplier: 10; offset: 10; value on HORIZON: 235x10 - 20 = 3.5
COV	In the case of numerical encodings, it allows you to set a threshold, below which variations in value are ignored and not “propagated” within the supervision. *Note: for decimal values, use the period as the separator*
STATUS	Current register value.

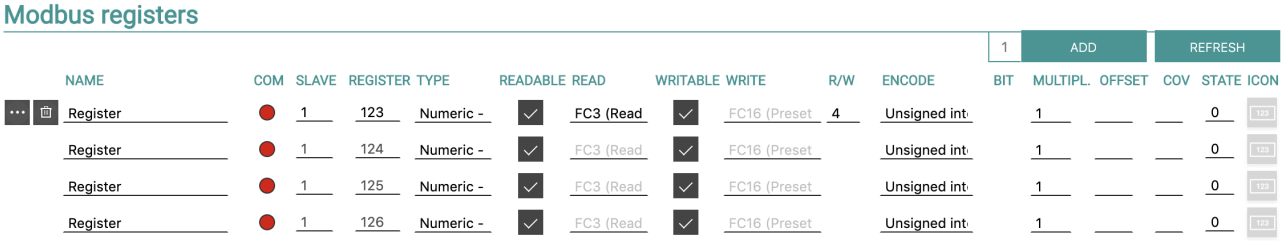
ICON	Choice of graphic set to display in the Frontend register. Lets you choose which icon to use in HORIZONE's “FRONTEND” to graphically represent the register. The library of available icons depends on the selection of the register type (Boolean or Numerical).

Press the “UPDATE" button to the left of the Modbus Registers bar to confirm the creation or changes of the logs and make them active. Once the communication has started, the coloured indicator in the COM column indicates whether the register is reachable or not.

Multiple reads and writes

It is possible to read and/or write simultaneously to more than one register; this option is necessary (setting the value “2”) for registers that adopt 4-byte encoding, but more generally it can be used (if the slave device supports it) to operate on contiguous registers with a single read/write operation, thus speeding up communication.

To activate a multiple read/write, enter a value other than “1” in the R/W field; the same number of “sub-objects” are automatically created (with respect to the main register) as the number of read/write set, automatically configured with the registers adjacent to the first:



Sub-objects must share some attributes with the former, such as read/write flags and encoding. Conversely, it is possible to enter the multiplication factor, COV and icon set independently, since they represent independent values in the graphic supervision (which could also represent quantities of different types).

Register details

By clicking on the edit button of a register, you access its detail tab, which basically contains the same information already contained in the list described in the previous chapter.

Events and connections

Within the tab of a Register object, it is possible to associate actions that must be automatically performed with the change of status, whether caused by the user through the HORIZONE supervision pages, due to a change detected by the bus or even through automatic HORIZONE functions such as scenarios, logics, schedules etc. These types of actions are called “connections”.

You can also associate Modbus register objects with other supervision objects to make logics or transfer data to other technologies (e.g. KNX) through PROGRAMMABLE EVENTS.

For more information about programmable connections and events, see the HORIZONE SERVER general INSTALLATION MANUAL.

REVISIONS

DATE	REFERENCE	COMMENTS
03/03/2020	IN00B02WEBFI00040134	

OPEN SOURCE

HORIZONE SERVER contains open source software, such as the Linux operating system, and its kernel. These software components are subject to several open-source licenses, including:

- GNU General Public License (GPL)

  https://www.gnu.org/licenses/gpl-2.0.html

- GNU Lesser General Public License (LGPL)

  https://www.gnu.org/licenses/lgpl-2.0.en.html

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