



Guide for configuring and working with the Modbus Wrapper integration module

ACFA PSIM 1.1

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1 List of terms used in the Guide for configuring and working with the Modbus Wrapper integration module

Modbus is a communication protocol which is based on the master-slave architecture. To transfer the data, it uses the interfaces such as RS-485, RS-422, RS-232 (Modbus RTU protocol), and also Ethernet of TCP/IP network (Modbus TCP protocol).

Modbus Device is the automation system device (controller, sensor, operating mechanism) supporting the Modbus protocol.

Modbus Register is the Modbus protocol data type.

Modbus Rule is the *ACFA PSIM* microprogram used for processing the *BACnet* property settings.

2 Introduction into the Guide for configuring and working with the Modbus Wrapper integration module

On the page:

- Purpose of the document
- General information about the Modbus Wrapper integration module

2.1 Purpose of the document

The Guide for configuring and working with the Modbus Wrapper integration module is a reference and information guide meant for *Modbus Wrapper* configuration specialists.

This Guide presents the following materials:

1. General information about the *Modbus Wrapper* integration module.
2. Configuration of the *Modbus Wrapper* integration module.
3. Working with the *Modbus Wrapper* integration module.

2.2 General information about the Modbus Wrapper integration module

The *Modbus Wrapper* integration module can carry out data exchange, get events and send commands to Modbus TCP or Modbus RTU protocols.

3 Supported hardware and licensing of the Modbus Wrapper integration module

The *Modbus Wrapper* module is licensed for 1 IP device.

Systems which operation is guaranteed by *Modbus Wrapper* universal integration are as follows:

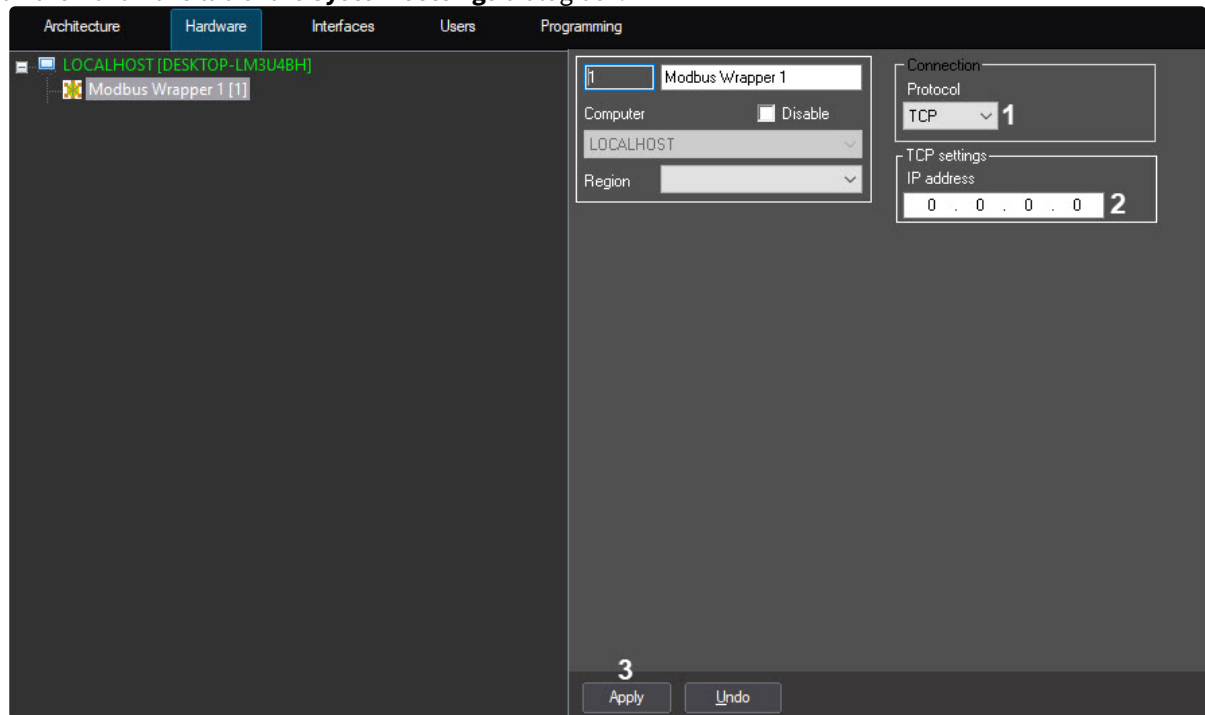
Name	Integration capabilities in Axxon PSIM software
Teletek IRIS Addressable Fire Alarm Panel (vendor: Teletek Electronics)	<ul style="list-style-type: none"> Getting information on detection tool states, inputs/ outputs, the panel itself, zones, and control commands
KSPA 9030-01 automatic fire fighting systems controller (vendor: PJSC «Gazprom avtomatizatsiya»)	<ul style="list-style-type: none"> Getting information on detection tool states
KZ fire fighting controller (vendor: OOO «Vega-GAZ»)	<ul style="list-style-type: none"> Getting information on detection tool states, inputs/ outputs, and control commands
Schrack Seconet fire alarm stations (vendor: Schrack Seconet AG)	<ul style="list-style-type: none"> Getting information on detection tool states
OptaSense perimeter intrusion detection system (vendor: OptaSense Ltd)	<ul style="list-style-type: none"> Getting information on detection tool states

4 Configuration of the Modbus Wrapper integration module

4.1 Configuring the Modbus Wrapper connection to ACFA PSIM

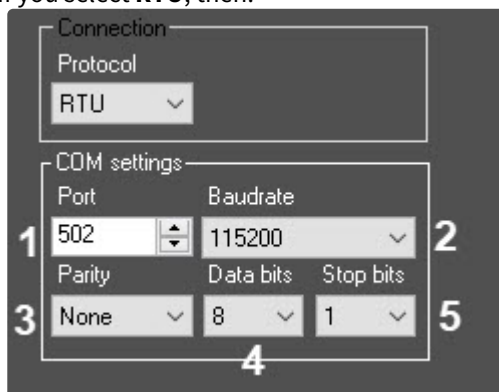
The *Modbus Wrapper* connection to *ACFA PSIM* is configured as follows:

1. Go to the settings panel of the **Modbus Wrapper** object that is created on the basis of the **Computer** object on the **Hardware** tab of the **System settings** dialog box.



2. From the **Protocol** drop-down list (1), select the protocol, over which the Modbus protocol will operate:
 - **TCP**—Modbus TCP.
 - **RTU**—Modbus RTU.

If you select **RTU**, then:



- Enter the Modbus device connection COM-port in the **Port** field (1).
- From the **Baudrate** drop-down list (2), select the data transfer speed over COM-port in bits per second.
- From the **Parity** drop-down list (3), select the control type by parity:

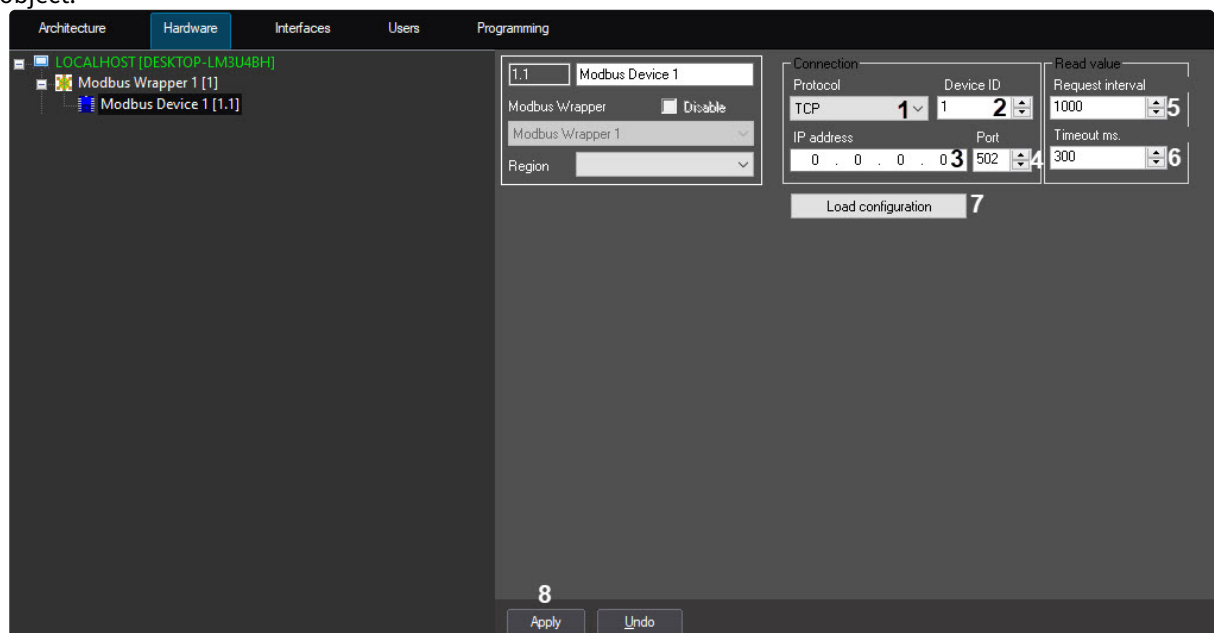
- **None**—control is disabled.
 - **Odd**—odd parity.
 - **Even**—even parity.
- iv. From the **Data bits** drop-down list (4), select the data format in bits: **7** or **8**.
 - v. From the **Stop bits** drop-down list (5), select the quantity of stop bits: **1**, **1.5**, or **2**.
3. Click the **Apply** button (3) to save the changes.

The *Modbus Wrapper* connection to *ACFA PSIM* is now configured.

4.2 Configuring the Modbus device

The *Modbus* device is configured as follows:

1. Go to the settings panel of the **Modbus Device** object that is created on the basis of the **Modbus Wrapper** object.



2. From the **Protocol** drop-down list (1), select the type of device connection to the *ACFA PSIM* Server.
 - **TCP**—connecting via Ethernet.
 - **RTU**—connecting via COM-port.
3. In the **Device ID** field (2), enter the device identification number which is specified in the device settings (Slave ID or Unit ID).
4. If you select the **TCP** protocol, enter the IP address and device port in the **IP address** (3) and **Port** (4) fields, respectively.
5. In the **Request interval** field (5), enter the polling period and new data reading from the device registers in milliseconds.
6. In the **Timeout ms.** field (6), enter the time period in milliseconds, during which the *Modbus* device must be polled and the data from its registers must be read, otherwise the connection will be lost. The default value is 300. If the connection is lost regularly, it is recommended to increase the value of the **Timeout ms.** field. The value is selected experimentally.
7. Click the **Load configuration** button (7) to build the tree of hardware and registers if there is a file of the *Modbus* register map in the **.mbmap** format. After clicking this button, it is necessary to select the corresponding file in the standard Windows window.
8. Click the **Apply** button (8) to save the changes.

The *Modbus* device is now configured.

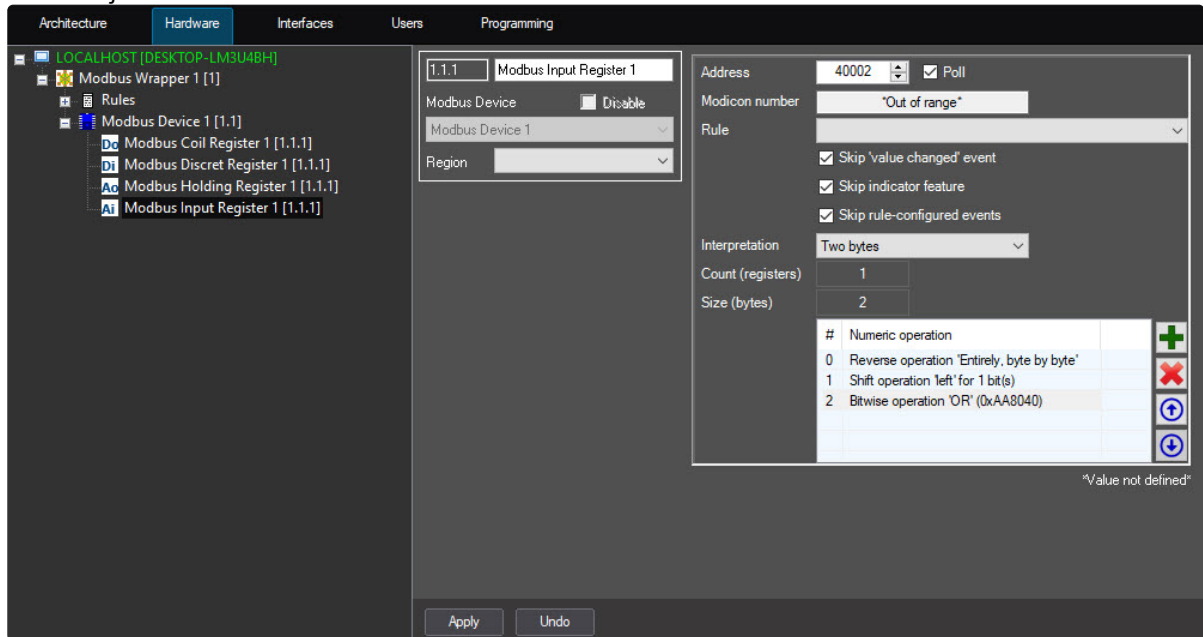
4.2.1 Configuring the Modbus Input Register

Note

The *Modbus* Input Register refers to the Analog Input. The Analog Input can only be read by getting the state of this input. The register size is 2 bytes.

The *Modbus* Input Register is configured as follows:

1. Go to the settings panel of the **Modbus Input Register** object that is created on the basis of the **Modbus Device** object.



2. In the **Address** field, specify the Input Register address in the register map of this device.

Attention!

- The registers map is provided by the manufacturer.
- The register address is always less than the register number by 1. The register address is specified in the settings.

3. Set the **Poll** checkbox to start polling the *Modbus* Input Register. This makes the settings available for editing.
4. From the **Rule** drop-down list, select the *Modbus* rule to which this Input Register complies (see [Configuring the Modbus Rule](#)).
5. Set the **Skip 'value changed' event** checkbox, so that the *Event Viewer* window doesn't display the events of Input Register value change.
6. Set the **Skip indicator feature** checkbox to disable the display of the Input Register value on the map in text form.


Attention!

Change of this parameter is applied after you restart the *ACFA PSIM* Server.


7. Set the **Skip rule-configured events** checkbox, so that the *Event Viewer* window doesn't display the events of rule triggering.



8. From the **Interpretation** drop-down list, select the Input Register data format:

- **Two bytes,**
- **Two bytes (signed),**
- **Four bytes,**
- **Four bytes (signed),**
- **Four bytes (floating),**
- **Eight bytes,**
- **Eight bytes (signed),**
- **Eight bytes (floating).**

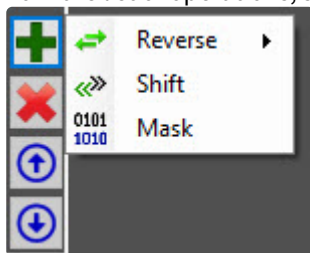
9. To add a numeric operation to the table, click the  button.

Note

To delete a numeric operation from the table, click the  button.

You can change the sequences of operations using the following buttons: to move up one position, click the  button, to move down one position, click the  button.

10. From the list of operations, select:

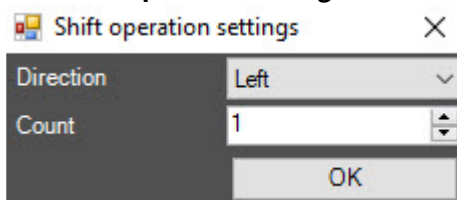


a. **Reverse.** Select from the available options:

- **Entirely, byte by byte,**
- **Entirely, bit by bit,**
- **Bits in byte,**
- **Bits in words,**
- **Bytes in words,**
- **Bytes in double words,**
- **By words (per 2 bytes),**
- **Bits in double words,**
- **By double words (per 4 bytes).**

b. **Shift.**

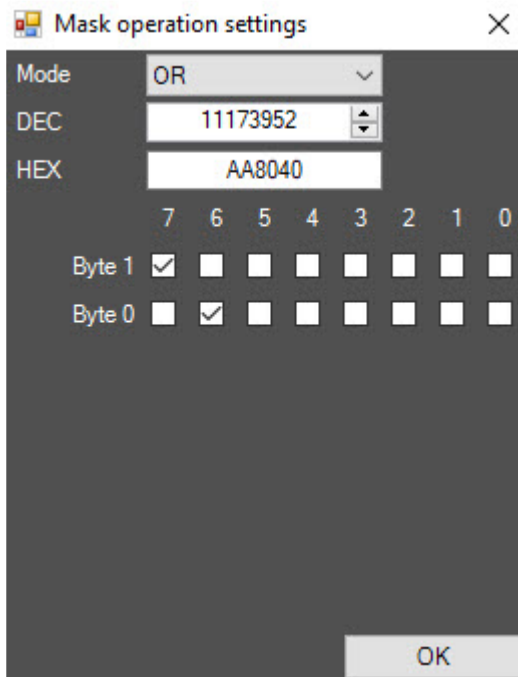
In the **Shift operation settings** window:



- i. From the **Direction** drop-down list, select in which direction the Input Register value is shifted: **Left** (default) or **Right**.
- ii. In the **Count** field, specify how many bits are shifted. The default value is **1**.
- iii. Click the **OK** button to save the settings.

c. **Mask.**

In the **Mask operation settings** window:



- i. From the **Mode** drop-down list, select the logical operator **AND** (default), **OR**, or **XOR**.
- ii. Specify the bitmask value in decimal (**DEC**) or hexadecimal (**HEX**) format, or set the corresponding checkboxes.
- iii. Click the **OK** button to save the settings.

11. Click the **Apply** button to save the settings.

The *Modbus* Input Register is now configured.

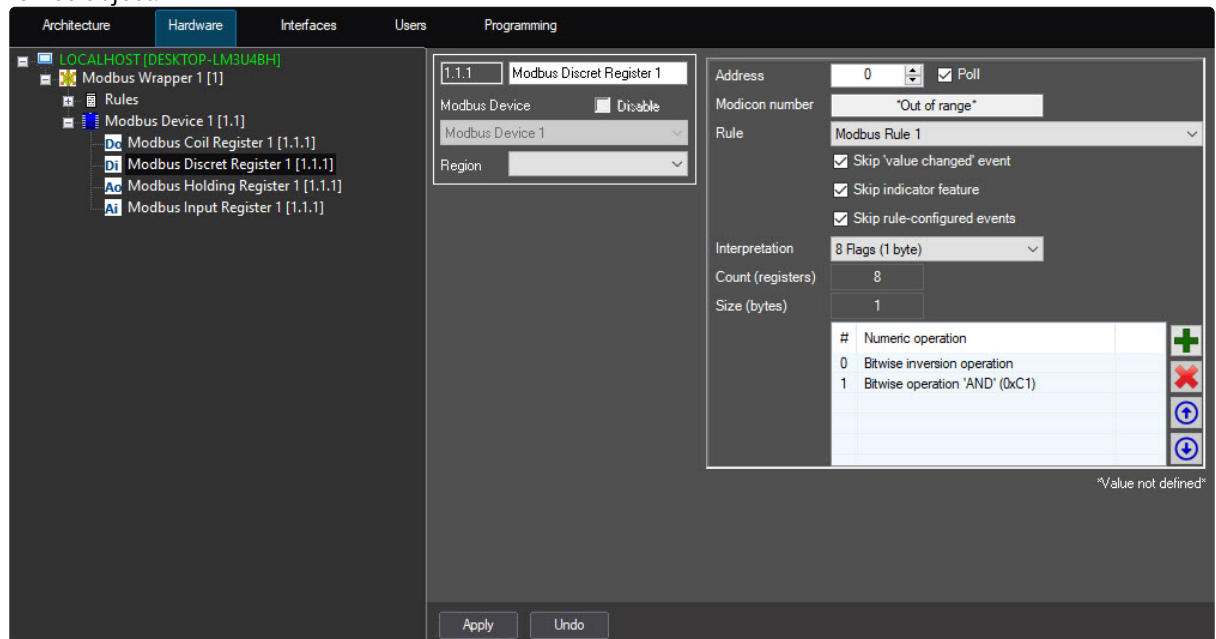
4.2.2 Configuring the Modbus Discret Register

Note

The *Modbus* Discret Register refers to the Digital Input. It is possible to only read the Digital Input by getting the real state of this input on sensor or device. The register size is 1 bit.

The *Modbus* Discret Register is configured as follows:

1. Go to the settings panel of the **Modbus Discret Register** object that is created on the basis of the **Modbus Device** object.



2. In the **Address** field, enter the Discret Register address in the register map of this device.

⚠ Attention!


- The registers map is provided by the manufacturer.
- The register address is always less than the register number by 1. The register address is specified in the settings.

3. Set the **Poll** checkbox to start polling the *Modbus* Discret Register. This makes the settings available for editing.
4. From the **Rule** drop-down list, select the *Modbus* rule to which this Discret Register complies (see [Configuring the Modbus Rule](#)).
5. Set the **Skip 'value changed' event** checkbox, so that the *Event Viewer* window doesn't display the events of Discret Register value change.
6. Set the **Skip indicator feature** checkbox to disable the display of the Discret Register value on the map in text form.




⚠ Attention!

Change of this parameter is applied after you restart the *ACFA PSIM* Server.

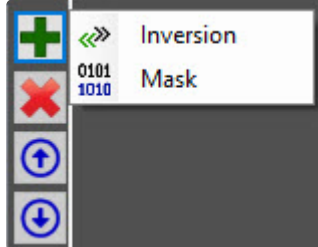
7. Set the **Skip rule-configured events** checkbox, so that the *Event Viewer* window doesn't display the events of rule triggering.
8. From the **Interpretation** drop-down list, select the Discret Register data format:
 - **Single Flag**,
 - **8 Flags (1 byte)**,
 - **16 Flags (2 bytes)**.

9. To add a numeric operation to the table, click the  button.

i Note

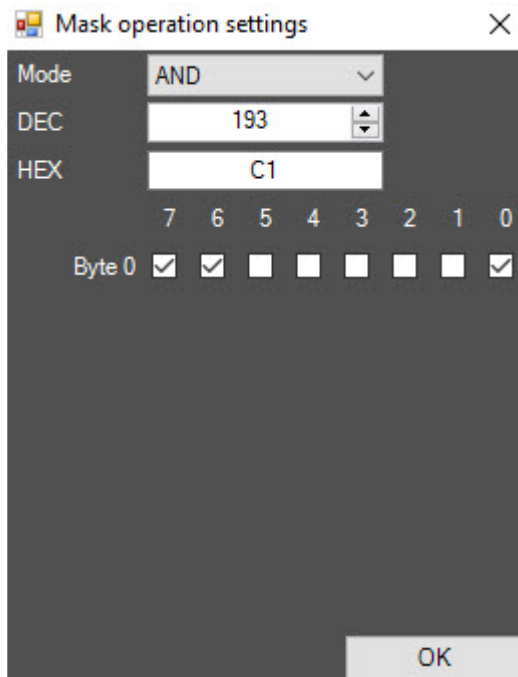
To delete a numeric operation from the table, click the  button.
 You can change the sequences of operations using the following buttons: to move up one position, click the  button, to move down one position, click the  button.

10. From the list of operations, select:



- a. **Inversion.**
- b. **Mask.**

In the **Mask operation settings** window:



- i. From the **Mode** drop-down list, select the logical operator **AND** (default), **OR**, or **XOR**.
- ii. Specify the bitmask value in decimal (**DEC**) or hexadecimal (**HEX**) format, or set the corresponding checkboxes.
- iii. Click the **OK** button to save the settings.

11. Click the **Apply** button to save the settings.

The *Modbus* Discret Register is now configured.

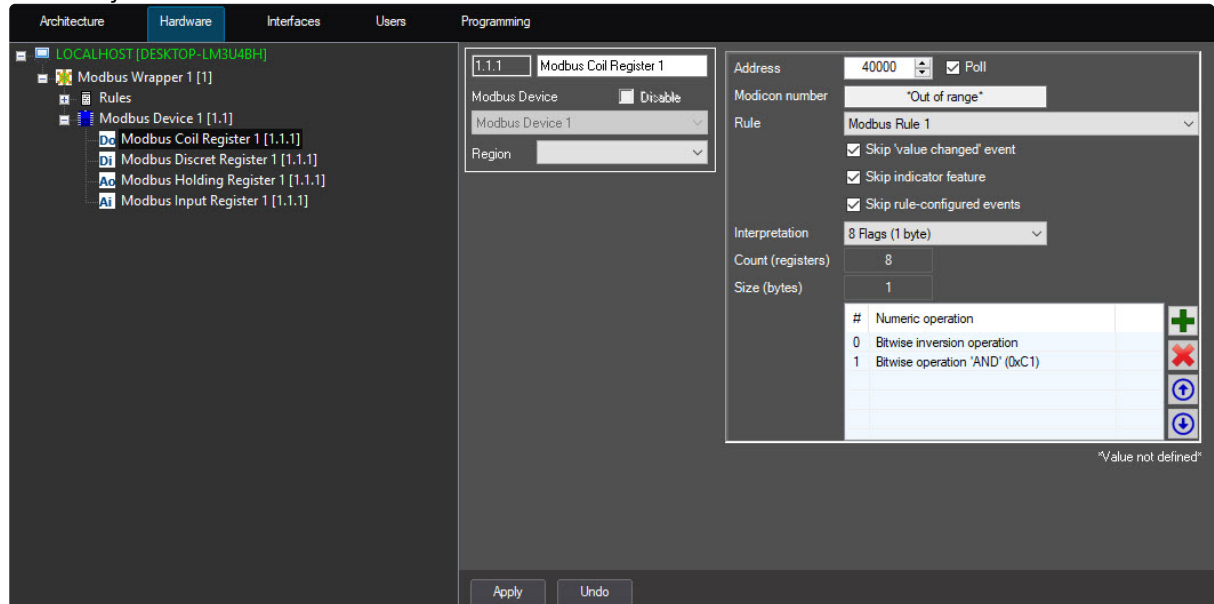
4.2.3 Configuring the Modbus Coil Register

 **Note**

The Modbus Coil Register refers to the Digital Output, or Coil. It is possible to either read or write the Digital Output. The register size is 1 bit.

The *Modbus* Coil Register is configured as follows:

1. Go to the settings panel of the **Modbus Coil Register** object that is created on the basis of the **Modbus Device** object.



2. In the **Address** field, enter the Coil Register address in the register map of this device.


Note

- The registers map is provided by the manufacturer.
- The register address is always less than the register number by 1. The register address is specified in the settings.




3. Set the **Poll** checkbox to start polling the *Modbus* Coil Register. This makes the settings available for editing.
4. From the **Rule** drop-down list, select the *Modbus* rule to which this Coil Register complies (see [Configuring the Modbus Rule](#)).
5. Set the **Skip 'value changed' event** checkbox, so that the *Event Viewer* window doesn't display the events of Coil Register value change.
6. Set the **Skip indicator feature** checkbox to disable the display of the Coil Register value on the map in text form.

Attention!

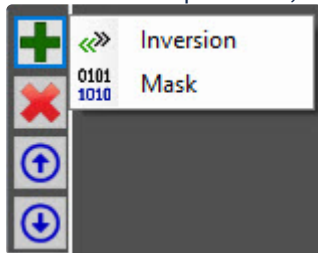
Change of this parameter is applied after you restart the *ACFA PSIM* Server.

7. Set the **Skip rule-configured events** checkbox, so that the *Event Viewer* window doesn't display the events of rule triggering.
8. From the **Interpretation** drop-down list, select the Coil Register data format:
 - **Single Flag**,
 - **8 Flags (1 byte)**,
 - **16 Flags (2 bytes)**.
9. To add a numeric operation to the table, click the  button.

Note

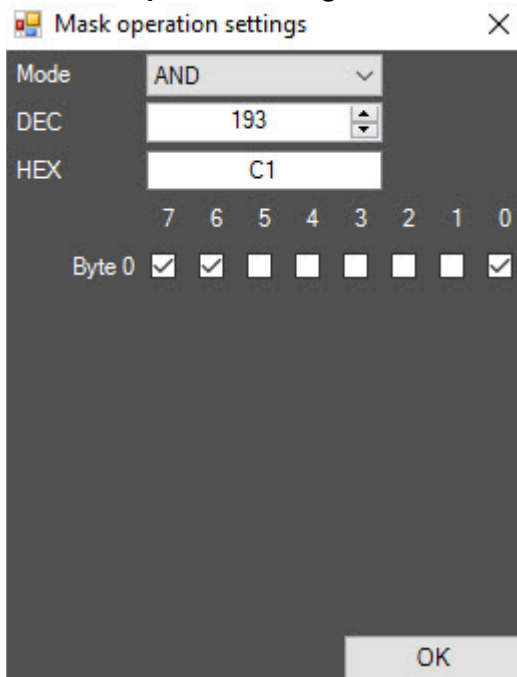
To delete a numeric operation from the table, click the  button.
 You can change the sequences of operations using the following buttons: to move up one position, click the  button, to move down one position, click the  button.

10. From the list of operations, select:



- a. **Inversion.**
- b. **Mask.**

In the **Mask operation settings** window:



- i. From the **Mode** drop-down list, select the logical operator **AND** (default), **OR**, or **XOR**.
- ii. Specify the bitmask value in decimal (**DEC**) or hexadecimal (**HEX**) format, or set the corresponding checkboxes.
- iii. Click the **OK** button to save the settings.

11. Click the **Apply** button to save the settings.

The *Modbus* Coil Register is now configured.

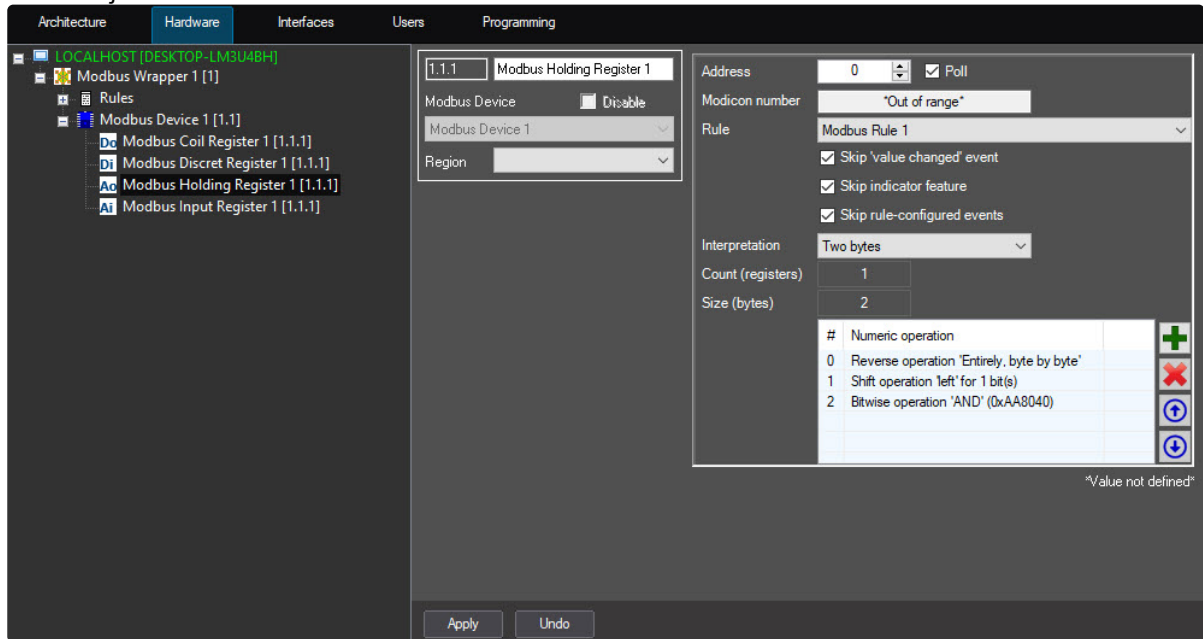
4.2.4 Configuring the Modbus Holding Register

Note

The *Modbus Holding Register* refers to the Analog Output or the Register containing some values which can be either written or read. The register size is 2 bytes.

The *Modbus Holding Register* is configured as follows:

1. Go to the settings panel of the **Modbus Holding Register** object that is created on the basis of the **Modbus Device** object.



2. In the **Address** field, enter the Holding Register address in the register map of this device.

Note

- The registers map is provided by the manufacturer.
- The register address is always less than the register number by 1. The register address is specified in the settings.

3. Set the **Poll** checkbox to start polling the *Modbus Holding Register*. This makes the settings available for editing.
4. From the **Rule** drop-down list, select the *Modbus* rule to which this Holding Register complies (see [Configuring the Modbus Rule](#)).
5. Set the **Skip 'value changed' event** checkbox, so that the *Event Viewer* window doesn't display the events of Holding Register value change.
6. Set the **Skip indicator feature** checkbox to disable the display of the Holding Register value on the map in text form.


Attention!

Change of this parameter is applied after you restart the *ACFA PSIM Server*.


7. Set the **Skip rule-configured events** checkbox, so that the *Event Viewer* window doesn't display the events of rule triggering.



8. From the **Interpretation** drop-down list, select the Holding Register data format:

- **Two bytes,**
- **Two bytes (signed),**
- **Four bytes,**
- **Four bytes (signed),**
- **Four bytes (floating),**
- **Eight bytes,**
- **Eight bytes (signed),**
- **Eight bytes (floating).**

9. To add a numeric operation to the table, click the  button.

Note

To delete a numeric operation from the table, click the  button.

You can change the sequences of operations using the following buttons: to move up one position, click the  button, to move down one position, click the  button.

10. From the list of operations, select:

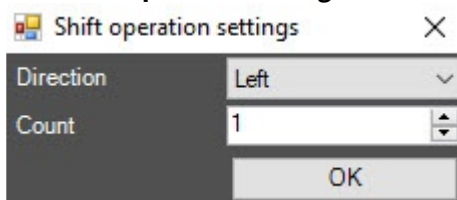


a. **Reverse.** Select from the available options:

- **Entirely, byte by byte,**
- **Entirely, bit by bit,**
- **Bits in byte,**
- **Bits in words,**
- **Bytes in words,**
- **Bytes in double words,**
- **By words (per 2 bytes),**
- **Bits in double words,**
- **By double words (per 4 bytes).**

b. **Shift.**

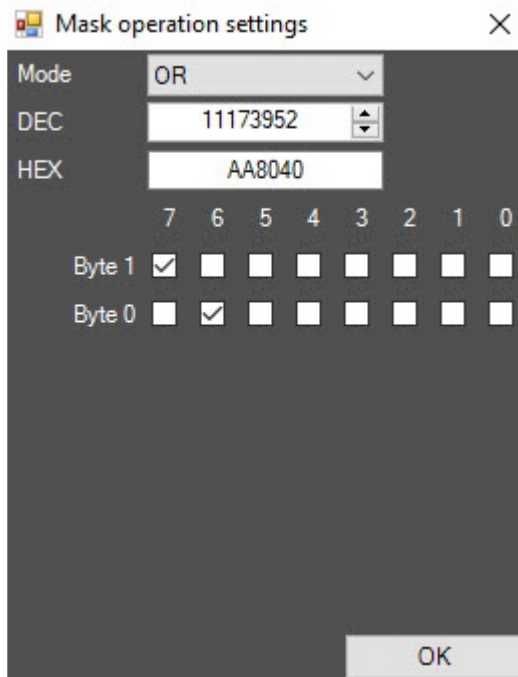
In the **Shift operation settings** window:



- i. From the **Direction** drop-down list, select in which direction the Holding Register value is shifted: **Left** (default) or **Right**.
- ii. In the **Count** field, specify how many bits are shifted. The default value is **1**.
- iii. Click the **OK** button to save the settings.

c. **Mask.**

In the **Mask operation settings** window:



- i. From the **Mode** drop-down list, select the logical operator **AND** (default), **OR**, or **XOR**.
- ii. Specify the bitmask value in decimal (**DEC**) or hexadecimal (**HEX**) format, or set the corresponding checkboxes.
- iii. Click the **OK** button to save the settings.

11. Click the **Apply** button to save the settings.

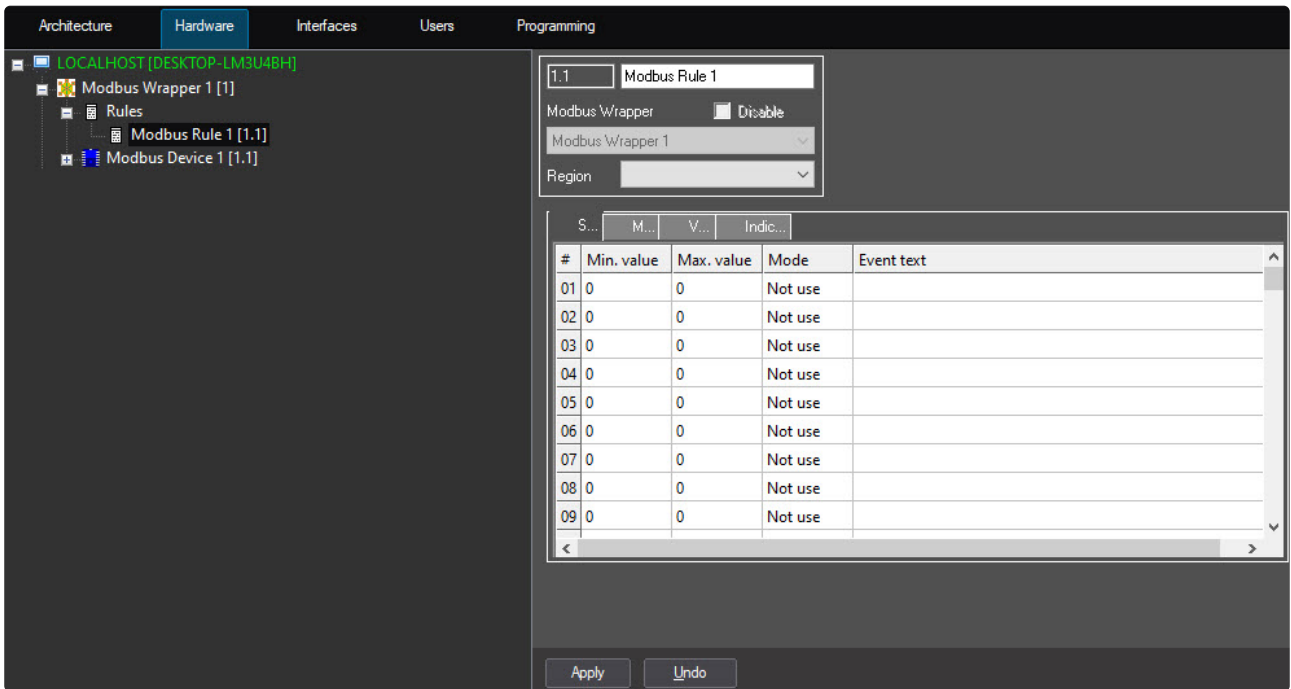
The *Modbus* Holding Register is now configured.

4.3 Configuring the Modbus Rule

Rules allow generating the events, changing the system states or indicator states in case of taking on the particular value by the Register.

Rules are configured on the **Modbus Rule** object settings panel, which is created on the basis of the **Modbus Wrapper** object.

It is allowed to specify up to 10 conditions in every rule. Every condition corresponds to one state on the map (see [Working with the Modbus Wrapper integration module](#)).



4.3.1 Setting up the Modbus State Change Rule

The *Modbus* State Change Rule is configured as follows:

1. Go to the **States** tab (1) on the **Modbus Rule** object settings panel.

#	Min. value	Max. value	Mode	Event text
01	0	0	Not use	
02	0	0	Not use	
03	0	0	Not use	
04	0	0	Not use	
05	0	0	Not use	
06	0	0	Not use	
07	0	0	Not use	
08	0	0	Not use	
09	0	0	Not use	

2. In the **Min. value** (2) and **Max. value** (3) columns, specify the register value range for which this condition will apply.
3. In the **Mode** column (4), select the action which will happen when the register takes on the value from the specified range:
 - **Not use**—no action.
 - **State**—channel state change on the map.
 - **Event**—event generation.
 - **Both**—state change and event generation.
4. In the **Event text** column (5), enter the message which will be received when the register takes on the value from the specified range.
5. Click the **Apply** button (6) to save the changes.

The *Modbus* State Change Rule is now configured.

4.3.2 Setting up the Register State Change Rule using the Modbus Mask

The Register State Change Rule using the *Modbus* Mask is configured as follows:

1. Go to the **Masks** tab (1) on the settings panel of the **Modbus Rule** object.

1.1 Modbus Rule 1

Modbus Wrapper Disable

Modbus Wrapper 1

Region

#	Value	Mask	Format	Mode	Event text
01			Hex	Not use	
02			Hex	Not use	
03			Hex	Not use	
04			Hex	Not use	
05			Hex	Not use	
06			Hex	Not use	
07			Hex	Not use	
08			Hex	Not use	
09			Hex	Not use	

2 3 4 5 6

7

Apply Undo

2. In the **Value** column (2), enter the channel value.
3. In the **Mask** column (3), enter the bit mask.
4. In the **Format** column (4), select the channel value format:
 - **Bin**—binary value format.
 - **Dec**—decimal value format.
 - **Hex**—hexadecimal value format.
5. In the **Mode** column (5), select the action which will happen when the register takes on the specified value:
 - **Not use**—no action.
 - **State**—channel state change on the map.
 - **Event**—event generation.
 - **Both**—change state and event generation.
6. In the **Event text** column (6), enter the message which will be received when the register takes on the specified value.
7. Click the **Apply** button (7) to save the changes.

The Register State Change Rule using the *Modbus Mask* is now configured.

4.3.3 Setting up the value assignment commands to Modbus Register

The value assignment commands to *Modbus Register* are configured as follows:

1. Go to the **Values** tab (1) on the **Modbus Rule** object settings panel.

The screenshot shows the 'Modbus Rule' object settings panel. At the top, there is a title bar with '1.1' and 'Modbus Rule 1'. Below this, there are several configuration options: 'Modbus Wrapper' with a 'Disable' checkbox, 'Modbus Wrapper 1' (a dropdown menu), and 'Region' (another dropdown menu). A central table is visible, which is the 'Values' tab. The table has three columns: '#', 'Value to set', and 'Command text'. The table contains rows numbered 01 through 09, with the 'Value to set' column containing the value '0' for each row. The 'Command text' column is currently empty. At the bottom of the panel, there are two buttons: 'Apply' and 'Undo'. Numbered callouts (1, 2, 3, 4) are placed on the image to indicate specific elements: 1 points to the 'Values' tab, 2 points to the 'Value to set' column, 3 points to the 'Command text' column, and 4 points to the 'Apply' button.

#	Value to set	Command text
01	0	
02	0	
03	0	
04	0	
05	0	
06	0	
07	0	
08	0	
09	0	

2. In the **Value** column (2), enter the channel value.
3. In the **Command text** column (3), enter the message which will be received when the register takes on the specified value.
4. Click the **Apply** button (4) to save the changes.

The value assignment commands to *Modbus Register* are now configured.

4.3.4 Setting up the Status Change Rule of Modbus Indicator

The Status Change Rule of *Modbus Indicator* is configured as follows:

1. Go to the **Indicators** tab (1) on the **Modbus Rule** object settings panel.

#	V. min	V. max	S. min	S. max	Color
01	0	1000	0	100	×
02	0	1000	0	100	×
03	0	1000	0	100	×
04	0	1000	0	100	×
05	0	1000	0	100	×
06	0	1000	0	100	×
07	0	1000	0	100	×
08	0	1000	0	100	×
09	0	1000	0	100	×

2. In the **V. min** (2) and **V. max** (3) columns, specify the register value range for which this condition will apply.

⚠ Attention!

If the register value falls into several ranges at once, then the indicator will take the value according to the condition with the smallest serial number of all the suitable conditions.

3. In the **S. min** (4) and **S. max** (5) columns, specify the indicator value range which it will take depending on the register value range.
4. In the **Color** column (6), select the indicator colors using the Windows default color palette.
5. Click the **Apply** button (7) to save the changes.

📘 Note

The precise indicator value is calculated according to the following formula:

$$S = \frac{(V - V.min)(S.max - S.min)}{V.max - V.min} + S.min$$

, where V is the precise item value.

The Status Change Rule of *Modbus* Indicator is now configured.

5 Working with the Modbus Wrapper integration module

5.1 General information on working with the Modbus Wrapper module

The following interface objects are used for the *Modbus Wrapper* integration module operation:

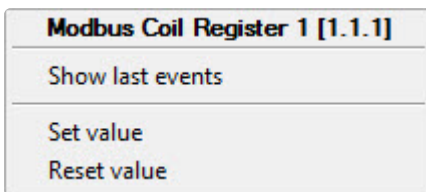
1. **Map.**
2. **Event Log.**

For a detailed description of configuring these interface objects, refer to the *Axxon PSIM* software package. [Administrator's Guide](#).

For a detailed description of using these interface objects, refer to the *Axxon PSIM* software package. [Operator's Guide](#).

5.2 Managing the Modbus Coil Register

The *Modbus* Coil Register is managed in the **Map** interactive window using the **Modbus Coil Register** object functional menu:












The *Modbus* Coil Register object functional menu commands description is given in the table.

Menu command	Function performed
Set value	Enables Digital Output
Reset value	Disables Digital Output

The *Modbus* Coil Register object can have the following states:

Modbus Coil Register 1 [1.1.1] 	Standard
Modbus Coil Register 1 [1.1.1] 	State 1
Modbus Coil Register 1 [1.1.1] 	State 2

Modbus Coil Register 1 [1.1.1] 	State 3
Modbus Coil Register 1 [1.1.1] 	State 4
Modbus Coil Register 1 [1.1.1] 	State 5
Modbus Coil Register 1 [1.1.1] 	State 6
Modbus Coil Register 1 [1.1.1] 	State 7
Modbus Coil Register 1 [1.1.1] 	State 8
Modbus Coil Register 1 [1.1.1] 	State 9
Modbus Coil Register 1 [1.1.1] 	State 10
Modbus Coil Register 1 [1.1.1] 	Not used

Note

The corresponding condition number of the rule is displayed on the channel state image.

The Register indicator takes on value and color according to the rule (see [Configuring the Modbus Rule](#)). If a new Register value does not meet any of the indicator rules, then it disappears.

If the channel value meets several states, the state image changes running through all the states. When you click on it, the smaller images of all the register states are displayed.

5.3 Managing the Modbus Holding Register

The *Modbus* Holding Register is managed in the **Map** interactive window using the **Modbus Holding Register** object functional menu:



The *Modbus* Holding Register object functional menu commands description is given in the table.



Menu command	Function performed
Change value	Sets the specified Analog Output value in the Modbus Holding Register object settings

The *Modbus* Holding Register states are similar to the *Modbus* Coil Register states (see [Managing the Modbus Coil Register](#)).

5.4 Managing the Modbus Device, Input Register, Discrete Register

The *Modbus* Device, Input Register, Discrete Register are not managed in the **Map** interactive window.

The *Modbus* Device can have the following states:

Modbus Device 1 [1.1] 	Disconnected
Modbus Device 1 [1.1] 	Connected

The *Modbus* Input Register, Discrete Register states are similar to the *Modbus* Coil Register states (see [Managing the Modbus Coil Register](#)).