Getting started

Creating a simple Iolog SS3000 modules Modbus Rtu application
1. Introduction

In this guide we propose, as an example, the design of a simple supervision application that communicate with Iolog SS3000 data acquisition modules using Modbus RTU protocol; this example is a little step towards the design of more complex SCADA applications, but it can be useful for anybody who approaches for the first time to a SCADA, and in particular to Winlog Lite/Pro software, to quickly understand how to communicate with these devices.

Sielco Sistemi provides a series of flexible and easy to use data acquisition modules; available modules are:

- SS 3014 4 RTD, Res, Pot Analog Inputs
- SS 3015 4 V or mA Analog Inputs
- SS 3016 4 Tc, mV, mA Analog Inputs
- SS 3017 8 V or mA Analog Inputs
- SS 3018 8 Tc, mV, mA Analog Inputs
- SS 3024 4 0..10V - 0..20mA analog Outputs
- SS 3130 4 Digital Inputs + 4 Relays
- SS 3148 12 Digital Inputs
- SS 3188 8 Digital Inputs + 8 Digital Outputs
- SS 3018 8 Thermocouple Inputs (address 5)
- SS 3188 8 Digital Inputs + 8 Digital Outputs (address 9)

When you design a new application, it is necessary to know for each external device: the communication protocol, the address and the list of variables that you want read or write.

Let us suppose to create an application that communicates through a Modbus RTU protocol with the 2 following devices:

- SS 3018 8 Thermocouple Inputs (address 5)
- SS 3188 8 Digital Inputs + 8 Digital Outputs (address 9)

We have to read Input1,…,Input 8 numeric variables and to activate Out1,…,Out8 digital variables (Control) of these two devices.

Our aim is to realise a simple 8 loops temperature controller; for each loop, when temperature is under a low threshold, a control output becomes active (ON/OFF).

Iolog SS3000 acquisition modules are released with the following configuration:

**Protocol:** MODBUS RTU  -  **Baud Rate:** 38400  -  **Address:** 1

To modify the configuration, please refer “Configuring Iolog SS3000 modules using Winlog” guide.
2. Creating the project

To create a new supervision project, it is necessary to use Project Manager, the Winlog Lite/Pro integrated development environment that provides different tools (Gate Builder, Template Builder, Code Builder, Application Builder).

Run Project Manager selecting own icon from Start menu

It is possible to create a new project in the standard way (see the guide “Getting started - Creating a simple Modbus protocol application”) or using SS3000 instruments Winlog Lite/Pro internal library.

Winlog Lite/Pro can automatically create SCADA applications by using Application Builder, a powerful tool that allows a drastic reduction of development time. Any application can be built by simply taking up from a library and putting together objects that refer to various automation devices (PID controllers, indicators, data acquisition modules, motor drives, ...).

Objects include tags, protocols, templates and all information required for device supervision and programming (eg. device front view, configuration templates, ...). Events and alarms that can be managed by Winlog Lite/Pro are also included.

Winlog Lite/Pro includes a device library with IOlog SS3000 data acquisition modules.

Select Application Builder from Tools menu and insert the project name (for example Test).

Add devices to the project picking them from the available ones clicking on Add button

Add devices on the channel 1 using different addresses:

<table>
<thead>
<tr>
<th>Device Name</th>
<th>Channel</th>
<th>Description</th>
<th>Address</th>
<th>Device to Add</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOlog SS3018</td>
<td>1</td>
<td>8 Thermocouple Inputs</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>IOlog SS3188</td>
<td>1</td>
<td>8 Digital Inputs e 8 Digital Outputs</td>
<td>9</td>
<td>1</td>
</tr>
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Adding devices in the project

Press Ok button and then Create Application button; in this way you create a tree structure with all supervision project elements.
3. Communication channel configuration

From elements in Configuration folder select Channels.

Define the logic channel 1 to communicate in Modbus RTU.

Protocol selection

Press button Options... and select the serial port to assign to the channel (for example COM1). It is necessary to set serial port specifying Baud rate, Parity, Stop bits, Data bits, Time out and Query Pause (for these parameters refer to manufacturer data device, an example is provided in the figure).
4. Creating local variables database

Now we can insert in gates database the local variables required to define 8 setpoint values necessary for ON/OFF control.

Numeric gates include all those variables that refer to an analog quantity (for example: measured variables, set-points, alarm threshold ..) and can be expressed by a byte, a word, a double word, an integer or by a floating-point variable.

For a more exhaustive discussion, refer to the guide “Getting started - Creating a simple Modbus protocol application”.

To edit the variables database, you need to run Gate Builder.

From Project Manager, select Gates folder and double-click on each of icons (Numeric, Digital, ...).

Variables database creation

Suppose you need to add the following variables to the variables created by the Application Builder:

<table>
<thead>
<tr>
<th>Name</th>
<th>Channel</th>
<th>Device</th>
<th>Address</th>
<th>Type</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>105Setpoint 1</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 1</td>
</tr>
<tr>
<td>105Setpoint 2</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 2</td>
</tr>
<tr>
<td>105Setpoint 3</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 3</td>
</tr>
<tr>
<td>105Setpoint 4</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 4</td>
</tr>
<tr>
<td>105Setpoint 5</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 5</td>
</tr>
<tr>
<td>105Setpoint 6</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 6</td>
</tr>
<tr>
<td>105Setpoint 7</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 7</td>
</tr>
<tr>
<td>105Setpoint 8</td>
<td>1</td>
<td>5</td>
<td>Internal Variable</td>
<td>Signed Word</td>
<td>°C</td>
<td>Temperature Setpoint Ch 8</td>
</tr>
</tbody>
</table>
4.1 Numeric variables configuration

Execute numeric gates 105Setpoint 1 - 105Setpoint 8 configuration.

*Configuration of numeric gate 105Setpoint 1*

![Numerical gates configuration](image1)

105Setpoint 1 numeric variable configuration – General folder

![Numerical gates configuration](image2)

105Setpoint 1 numeric variable configuration – Sampling folder
After defining 105Setpoint 1 variable copy and paste 7 times in **Gate Builder** the database row related to this variable, verifying that automatically **N ID** parameter increases.

**End result**

After you have defined all numeric variables, you should see the **Gate Builder** main page similar to the one shown below.
5. Creating the setpoints template

Now it is necessary to create a template to insert the control setpoint values.

Select Template folder and create a new template, selecting the item New > File from Edit menu. Rename the just created template using the name Setpoint, do this selecting it and then using Rename item from Edit menu.

Double-clicking on created template, Template Builder start in order to build the graphic page.

5.1 Declaring template variables

First it is necessary to declare which variables we will use in the template; in this example we will use setpoint related variables.

Click on button alongside of the Gates item in the Property Editor (Property Editor is the window on the left side of the screen that allows to modify template elements properties).

A new windows will appear; press Add gate button, select the first numeric gate and press Ok. Repeat this operation for each numeric, digital and alarm gate that belongs to the application.
5.2 Inserting a Label object

Firstly build a Frame that will contain all the elements that will be inserted later.

To do this, select Frame object among the ones on the upper bar ( ), it is the first on the left) and click on the template, a void rectangle will be displayed.

The next step is to insert into the created frame a static label that is a static text; select Label object among the ones on the upper bar ( ), then click into the frame. To modify the text displayed into the object, use Property Editor, click alongside of the property Label and digit SETPOINT 1.

Every described object can be formatted and placed as you like using Property Editor.

5.3 Inserting an Edit object

A control will be inserted that will allow to modify the value of the 105Setpoint1 gate and to send it to the software.

Select Edit ( ), then click into the frame.

To link the Edit object to the numeric variable 105Setpoint1, click on the button alongside of the item Gate in Property Editor and select NUM,105Setpoint,1 among the available gates.
Copy and paste Label and Edit objects 7 times, taking care to change text in Labels and reference gate in Edit.
The template is now ready and can be refined, modifying object properties.
6. Automatic display of templates

It is possible to show templates automatically at Winlog program startup.

From elements in Configuration folder select Template.

*Choosing the startup templates*

In **Startup templates** choose the templates that you want to start automatically.

At project startup, chosen templates will appear automatically.
7. Winlog Pro control code example

Now create the code function that allows to realize the ON/OFF control.

In Code folder create a file and rename it Control; opening it, Code Builder starts.

Creating a code file

Code Builder is the Winlog Pro programming environment; in this example we will use it only to define a function that will realize the ON/OFF control at the application startup.

Copy and paste the following code:

```plaintext
Function void ControlLoop()
  #startup // Function called at Winlog startup
  TPageOpen("Setpoint");
  int i;
  while (WindowIsOpen()) // Function active until Winlog is running
    // For each loop, if temperature is minor than setpoint, active the control output
    for i = 1 to 8 do
      if GetNumGateValue("105Input",i)<GetNumGateValue("105SetPoint",i) then
        if (GetDigGateValue("109Output",i)==0) then SetDigGateValue("109Output",i,1);end
        else
          if (GetDigGateValue("109Output",i)==1) then SetDigGateValue("109Output",i,0);end
        end
      end
    end
  Sleep(1000);       // Necessary for not freezing the system
end
end
```

To check syntax of the code use function Check syntax.
8. Project execution

Our example is complete.

Link devices to the serial port; to run the project, in **Project Manager** select **Execute...** from **Project menu**.

Now we are entering in the "run-time" phase that is application execution mode. **Winlog Lite/Pro** samples variables from devices and processes results in graphical representations (trends and template) and in tabular representations (reports and historical data).

At project startup, main template will appear automatically.

From **Supervision** menu you can display graphical trends; select menu item **Charts...** and define the group of variables that you want to display as graphical trends.

Again in **Supervision** menu you can display both the online status (**Status>Alarms...**) and the story (**Historical>Alarms...**) of all alarms that have been created with **Gate Builder**.