

# **Getting started**

Creating a simple IOlog SS3000 modules Modbus Rtu application

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## 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 theese 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 010V - 020mA analog Outputs
SS 3130	4 Digital Inputs + 4 Relays
SS 3148	12 Digital Inputs
SS 3188	8 Digital Inputs + 8 Digital Ouputs
SS 3580	RS232 / RS485-422 Converter
SS 3580-USB	USB / RS485-422 Converter

- SS 3580-TCP Ethernet Modbus TCP / RS485 Modbus RTU Converter
- **SS 3590** RS485-422 Repeater

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 (foe 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:

Device Name	Channel	Description	Address	Device to Add
IOlog SS3018	1	8 Thermocouple Inputs	5	1
IOlog SS3188	1	8 Digital Inputs e 8 Digital Outputs	9	1

4 Application Builder		
Application name : Test		
Devices Channels Options		
Device name	Channel Address	
		Add
		Modify
		Delete
		Sort
	1	
	Build Close	Help

Project name definition

Device	Device
Name IOLOG SS-3018-TC	Name IOLOG SS-3188
Туре	Туре
Channel 1 🔸 Address 5 📩	Channel 1 Address 9
Devices to add 1	Devices to add 1
Available languages English Italiano	Available languages English Italiano
Ok Cancel	Ok Cancel

Adding devices in the project

æ,	pplication Builder			
Ap	olication name : Test			
D	evices Channels Options			1
	Device name	Channel	Address	
	IOLOG SS-3018-TC IOLOG SS-3188	1 1	5 9	Add Modify Delete
				Sort
		Build	Close	Help

Project creation

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.

File Edit View Project Tools Help	<u>7 7 % µ α</u> 🛛 🕏		
Automatic Washing System Demo Car Simulation Ceramics Kiln Ceramics Kiln Ceramics Kiln Ceramics Kiln Configurator Pipes Simulation Configuration Gates Code Recipes Reports Template Images Keyboard WebTemplate Water Purifier Plant (Web Server)	Configuration  Configuration  ModBus RTU  ModBus RTU  ModBus RTU  ModBus RTU  ModBus RTU  Configuration  ModBus RTU  ModBus R	Devices	Access Groups

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 e Query Pause (for these parameters refer to manufacturer data device, an example is provided in the figure)

ModBus RTU Ver	. 1.33	
COM1	▼ COM port	
9600	▼ Baud rate	
None	▼ Parity	OK I
1	✓ Stop bits	Cancel
8	💌 Data bits	Help
1000	Read timeout [ms]	
1000	Write timeout [ms]	
20	Query pause [ms]	
Standard mode (HB	yte+LByte) 💽 Register form	nat

Protocol configuration

## 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, setpoints, 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 ehxaustive 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, ...).

2 • 48 48 48 48 • U   1	6 7 3	8 44 5		2					
王 태몰 Automatic Washing System Demo 코 태몰 Car Simulation 코 태몰 Ceramics Kiln	Nu Eve	meric ent/Alarm		) Digital	Co	ompound	📄 String		
🗄 🕞 Extruder Demo	7 0	ate Bui	lder - t	est					
🗉 🕞 Instrument Demo		Edit Vie							
ד נוסס Configurator ווייק ו			10 10 0.0	2. 					
ਦ 🕞 Pipes Simulation ⊐ 💼 Test	<b></b>	•		🖌 🖌 🖻	Ê	1 🐴	📫 🕄 🎫		
Configuration		Channel	Device	Gate ID	N ID	Address	Description	Measure	Variable ty
Gates	9	1	5	105CJC	0	3:0013	CUC		S_WORD
	10	1	5	105Input	1	3:0014	Input #1		S_WORD
	11	1	5	105Input	2	3:0015	Input #2		S_WORD
	12	1	5	105Input	3	3:0016	Input #3		S_WORD
Template	13	1	5	105Input	4	3:0017	Input #4		S_WORD
	14	1	5	105Input	5	3:0018	Input #5		S_WORD
Keyboard	15	1	5	105Input	6	3:0019	Input #6		S_WORD
WebTemplate	16	1	5	105Input	7	3:0020	Input #7		S_WORD
Water Purifier Plant (Web Server)	17	1	5	105Input	8	3:0021	Input #8		S_WORD
Yarn Plant Demo	18	1	5	105NULL	1		Reserved gate (for block)	1	DOUBLE
	19	1	9	109Communication	0	3:0005	Communication	1	U_WORD
	20	1	9	109Address	0	3:0006	Address		U WORD
	21	1	9	109Delay	0	3:0007	Rx Delay	ms	U WORD
	22	1	9	109Coils Input	0	3:0008	Coils Input	1.50	U WORD
	23	1	9	109Coils Output	0	3:0009	Uscite Output		U WORD
	24	1	9	109Coils	0	3:0010	Coils		U WORD
	25	1	9	109Power_Up_Safe	0	3:0011	Power Up Safe		U WORD
	26	1	9	109Watchdog Time		3:0012	Watchdog Timer	s	U WORD
	27	12	9	109NULL	1	-	Reserved gate (for block)		DOUBLE

Variables database creation

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

Name	Channel	Device	Address	Туре	Unit	Description
105Setpoint 1	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 1
105Setpoint 2	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 2
105Setpoint 3	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 3
105Setpoint 4	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 4
105Setpoint 5	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 5
105Setpoint 6	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 6
105Setpoint 7	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 7
105Setpoint 8	1	5	Internal Variable	Signed Word	°C	Temperature Setpoint Ch 8

### 4.1 Numeric variables configuration

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

Configuration of numeric gate 105Setpoint 1

Numerical gates	
General Sampling Value Conversion Tolerance	
105Setpoint 🔹 Gate ID 🔽 Record on historical file	
,	
1 NID	
Description	
Temperature Setpoint #1	-
Access groups Choose	
Ok	Help

105Setpoint 1 numeric variable configuration - General folder

Numerical gates	
General Sampling Va	lue Conversion Tolerance
1 •	Channel -> Protocol : <b>ModBus RTU</b> Device
	🗾 🖉 Address
Never 💌	Sample Read block
1	Sample freq. [Sec.]
	Ok Cancel Help

105Setpoint 1 numeric variable configuration - Sampling folder

Numerical gates	
General Sampling Value Conversion Tolerance	
0 Min. value	Decimal digits
0 Start value	О Туре
	ID
°C • Measure	NID
S_WORD  Variable type	Choose
	Ok Cancel Help

105Setpoint 1 numeric variable configuration - Value folder

After defining 105Setpoint 1 variable copy and paste 7 times in **Gate Builder** the database row related to this variable, verifying that automatically  $\mathbb{N}$  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.

<b>%</b> G	ate Build	er - test						
File	Edit View	Help						
<b>2</b>	😂 - 🔲 🗐 🖌 🖄 🛍 🛍 材 🦓 🏥							
	Channel	Device	Gate ID	N ID	Address	Description	Measure	Variable type
1	1	5	105Setpoint	1		Temperature Setpoint #1	°C	S_WORD
2	1	5	105Setpoint	2		Temperature Setpoint #2	°C	S_WORD
3	1	5	105Setpoint	3		Temperature Setpoint #3	°C	S_WORD
4	1	5	105Setpoint	4		Temperature Setpoint #4	°C	S_WORD
5	1	5	105Setpoint	5		Temperature Setpoint #5	°C	S_WORD
6	1	5	105Setpoint	6		Temperature Setpoint #6	°C	S_WORD
7	1	5	105Setpoint	7		Temperature Setpoint #7	°C	S_WORD
8	1	5	105Setpoint	8		Temperature Setpoint #8	°C	S_WORD
9	1	9	109Communication	0	3:0005	Communication		U_WORD
10	1	9	109Address	0	3:0006	Address		U_WORD
11	1	9	109Delay	0	3:0007	Rx Delay	ms	U_WORD
12	1	9	109Coils_Input	0	3:0008	Coils Input		U_WORD
13	1	9	109Coils_Output	0	3:0009	Uscite Output		U_WORD
14	1	9	109Coils	0	3:0010	Coils		U_WORD
15	1	9	109Power_Up_Safe	0	3:0011	Power Up Safe		U_WORD
16	1	9	109Watchdog_Timer	0	3:0012	Watchdog Timer	s	U_WORD
17	1	9	109NULL	1		Reserved gate (for block)		DOUBLE
<						>		
Nume	Numerical gates							

Numeric variable database

# 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

Project Manager		
File Edit View Project Tools Help		
📲 • 🖷 🖶 🎇 🖷 🖷 • 😈 💞	🍸 🗶 💾 🖉 🔟 🍰	
Automatic Washing System Demo     Car Simulation     Car Simulation     Extruder Demo     Instrument Demo     IDiog Configurator     IDiog Configurator     IDiog Configuration     Cas     Configuration     Gates     Code     Recipes     Reports     Template     Images     Keyboard     WebTemplate     Water Purifier Plant (Web Server)     Yarn Plant Demo	■ 105_SS-3018-TC ■ 109_SS-3188 ■ No Name          Rename File       ×         Name       Setpoint         OK       Cancel	

Template creating

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.

Property Editor		🌠 Sepoint	
emplate	Lawrence .	7 Template gates	
Property	Value	Gate Type Name Id	
Name	Sepoint	0 NUM 105Setpoint 1	+ +
Access group	0	1 NUM 105Setpoint 2 2 NUM 105Setpoint 3	
_eft	0	3 NUM 105Setpoint 4	Add gate
Гор	0	4 NUM 105Setpoint 5	Delete gate
√idth	476	5 NUM 105Setpoint 6 6 NUM 105Setpoint 7	
leight	260	7 NUM 105Setpoint 8	EditGate
8kColor	192,192,192		Optimize
iates	05Setpoint,6,NUM,105		opanize
)pen function			
Close function			
lidden	False		Ok
ityle	Standard		Cancel
itay on top	False		
		#	Help
		Gates Selection	
		Type Channel Device	
		Numeric 👻 All 👻 All 👻 Property	
		Name ID Description	-
		105Setpoint 1 Temperature Setpoint #1	
		105Setpoint 2 Setpoint Temperatura #2	
		105Setpoint 3 Setpoint Temperatura #3 105Setpoint 4 Setpoint Temperatura #4	
		105Setpoint 4 Setpoint Temperatura #4 105Setpoint 5 Setpoint Temperatura #5	
		105Setpoint 6 Setpoint Temperatura #6	
		1055 etpoint 7 Setpoint Temperatura #7 1055 etpoint 8 Setpoint Temperatura #8	

Template variables declaration

#### 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 (**A**), 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* ( **b**); 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.

🎸 Template Buil	lder - Test	
File Edit Help	dard Advanced Gadgets Powers	Study) 🛯 🄜 📴 💂 🗵 💿 🗮 👫 🍥 📧 🖃 🚞
Property Editor		🌠 Sepoint
Edit	Lana	
Property	Value	SETPOINT 1 Edit
ID	0	
Left	95	
Тор	15	
Width	70	
Height	21	
Description		
BkColor	196,255,196	
Cursor	(default)	
TxtColor	0,0,0	
Font	"MS Sans Serif",9,0000	Close
Gate	NUM,105Setpoint,1	
Need apply	No	
Password mode	No	
Validation string		
Style	Left	
Tab num	0	
Access group	0	
Enable		
Show		
Keyboard		
Help file name		

Edit object inserting

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.

🌮 Template Buil	lder - Test			
File Edit Help				
🗋 😂 🔛 Stand	dard Advanced Gadgets Powe	rStudy		
* 🖻 🛍 🔓	and the second		x . 🗄	H 🙆 🖬 🖃 📺
13				
Property Editor		🎸 Sepoint		
Button				
Property	Value	SETPOINT 1	Edit	
ID	0	SETPOINT 2	Edit	
Left	95	SETPOINT 3	Edit	
Тор	225	SETPOINT 4	Edit	
Width	75			
Height	25	SETPOINT 5	Edit	
Description		SETPOINT 6	Edit	
Cursor	(default)	SETPOINT 7	Edit	
Label	Close	SETPOINT 8	Edit	
Font	"MS Sans Serif",9,0000			
Function key			Close	
On Click	Close	2		
Tab num	8			
Access group	0			
Enable				
Show				
Help file name				

Template completion

# 6. Automatic display of templates

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

From elements in Configuration folder select Template.

File Edit View Project Tools Help
Automatic Washing System Demo     Car Simulation     Caramics Kin     Extruder Demo     Diog Configurator     Pipes Simulation     Gates     Code     Recipes     Reports     Reports     Reports     Reports     Moster Plant (Web Server)     Yan Plant Demo     Show default template selection if no templates opened     Show default template selection if no templates opened     Show default template selection if no templates opened

Choosing the startup templates

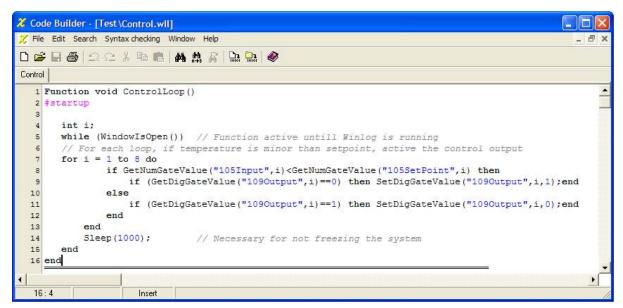
In Startup templates choose the templates that you want to start automatically.

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:

```
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
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.