

Applications Library

Note: The descriptions that follow offer links allowing access to the corresponding application.

If Zelio Soft 2 software is installed, a click on the link will open the program. You may then select simulation mode (1) and start the module (RUN) (2).



Floating pop-ups are available to change and view the input-output status. To view them or mask them, use the icon bar at the bottom of the screen:



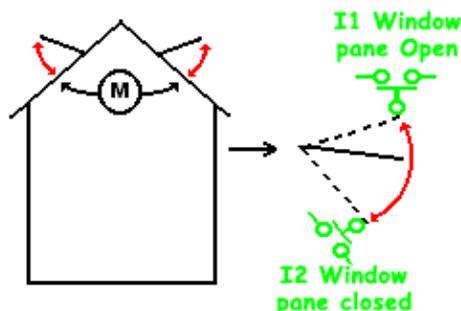
1 Applications in Ladder language

1.1 GREENHOUSE AUTOMATIC VENTILATION PANE CONTROL

Specifications:

The owner of a greenhouse would like to acquire an installation to manage the opening and closing of the ventilation window panes located on the greenhouse roof.

The greenhouse has two window panes to provide ventilation. The opening of these window panes is controlled by a motor and 2 sensors that indicate whether the window panes are open or closed:

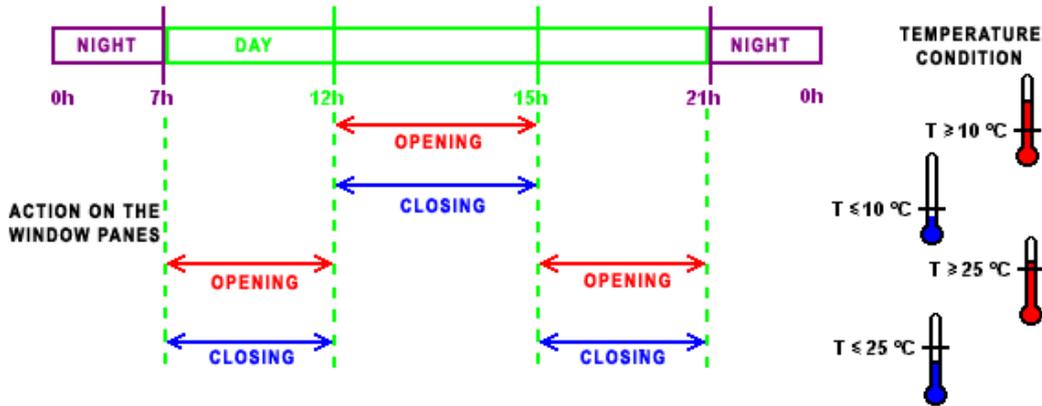


During the day, the window panes open to ventilate the structure from 12:00 to 15:00, at the time of day when, in principle, the temperature is the highest. However, if the temperature is less than 10°C, the window panes do not open, or when they are already open, they close.

In addition, the window panes open during the day when the temperature reaches 25°C. If the temperature falls below 25 °C, the window panes must close again.

Finally, at night, the window panes remain closed regardless of the temperature.

Summary diagram:



Description of the inputs/outputs:

INPUTS:	OUTPUTS:
I1 Opened window sensor	Q1 Opening of the window panes
I2 Closed window sensor	Q2 Closing of the window panes
IB Temperature (analog input)	

The temperature is supplied by a sensor with output voltage of 0 to 10 V.

Model Required:

Zelio Logic with clock and analog inputs.

SR2 B121 BD (24 V DC) ou **SR2 B121 JD** (12 V DC) par exemple.

Program Description:

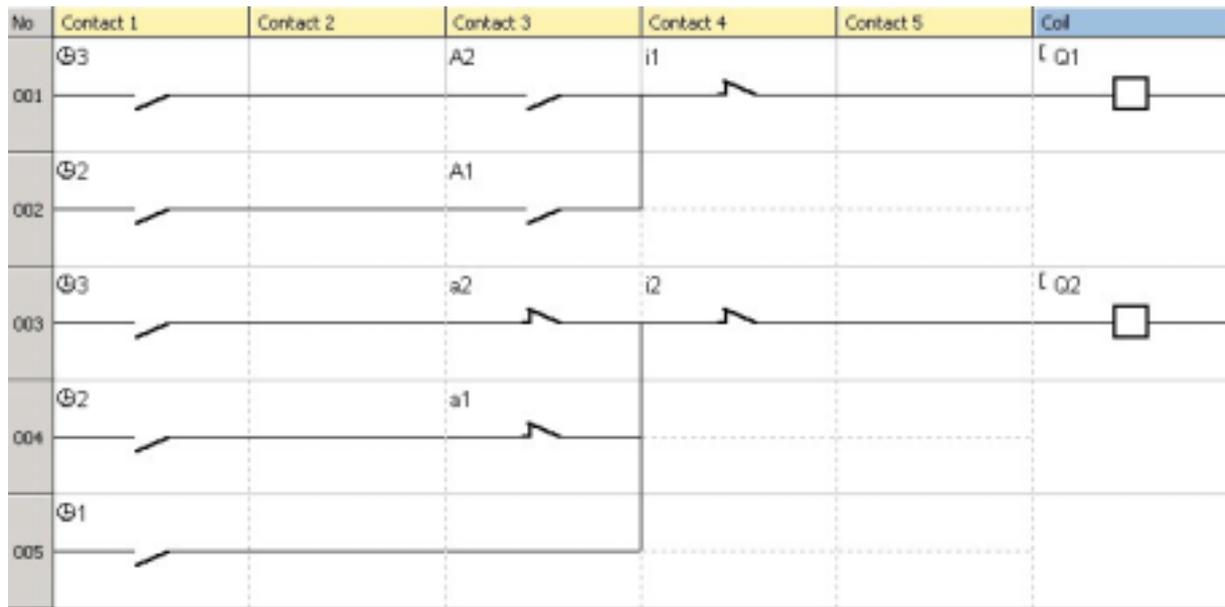
3 time ranges are used:

-**Range 1:** Night, from 21:00 to 07:00

-**Range 2:** Daytime, from 7:00 to 12:00 a.m. and from 3:00 to 9:00 p.m.

-**Range 3:** Noon, from 12:00 to 15:00

Logic diagram:



Click on the link below to access the application:

[Greenhouse automatic ventilation pane control \(ladder\)](#)

Note: Use the floating pop-up of analog input **IB** to vary the temperature. To call it up, click on the corresponding icon in the lower bar.

1.2 INDOOR/OUTDOOR LIGHTING OF A HOME

Specifications:

A homeowner would like to install a system capable of controlling the lighting of a stairway and outdoor entrance providing access to the home.

Outdoor Lighting: The circuit is activated at night by a twilight switch. A sensor detects any passage and activates the outdoor lighting for 2 minutes.

Indoor lighting: Two push-buttons are situated in the stairwell: one in the entrance, the other at the top of the stairs. Their function is identical. Time-delayed (2 minutes) lighting is obtained by quickly pressing one of the buttons.

Description of the inputs/outputs:

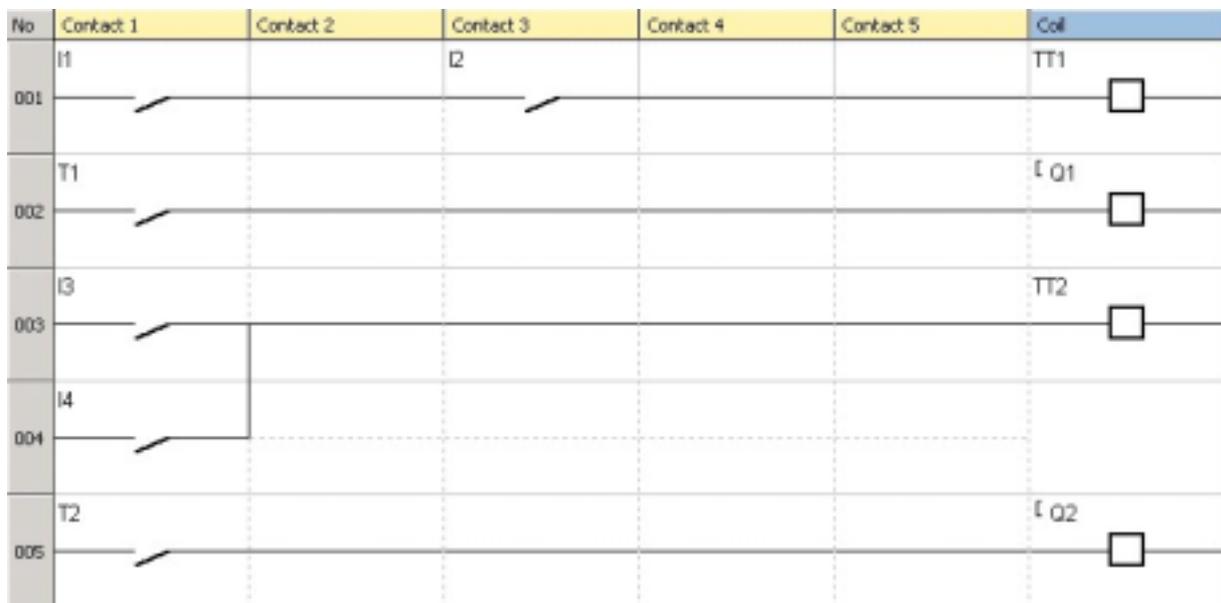
INPUTS:		OUTPUTS:	
I1	Passage sensor	Q1	Outdoor lighting
I2	Twilight switch	Q2	Indoor lighting
I3	Pushbutton		
I4	Pushbutton		

Model Required:

No specific condition:

SR2 B121 BD (24 VDC) for example.

Logic diagram:



Click on the link below to access the application:

[Indoor/Outdoor lightning of a home](#)

1.3 ACCESS CONTROL, AUTOMATIC GATE

Specifications:

A homeowner wants access to his residence to be controlled by an automatic gate equipped with a dual direction (opening and closure) motor.

Opening: Whether the gate is closed or in an intermediate position, the remote control signal causes the full opening of the gate. During the opening process, any new action on the remote control stops or restarts the motor.

As soon as the gate is fully open, a 4-second time delay delays its closure.

Closure: During the closing process, if the remote control is activated or if the sensor detects a passage, the gate is opened. As long as the sensor is activated, (vehicle stopped in the passage way for example), the gate remains fully open.

Description of the inputs/outputs:

<i>INPUTS:</i>	<i>OUTPUTS:</i>
I1 Remote control	Q1 Gate opening
I2 Gate closed position	Q2 Gate closure
I3 Gate closed position	
I4 Passage sensor	

Model Required:

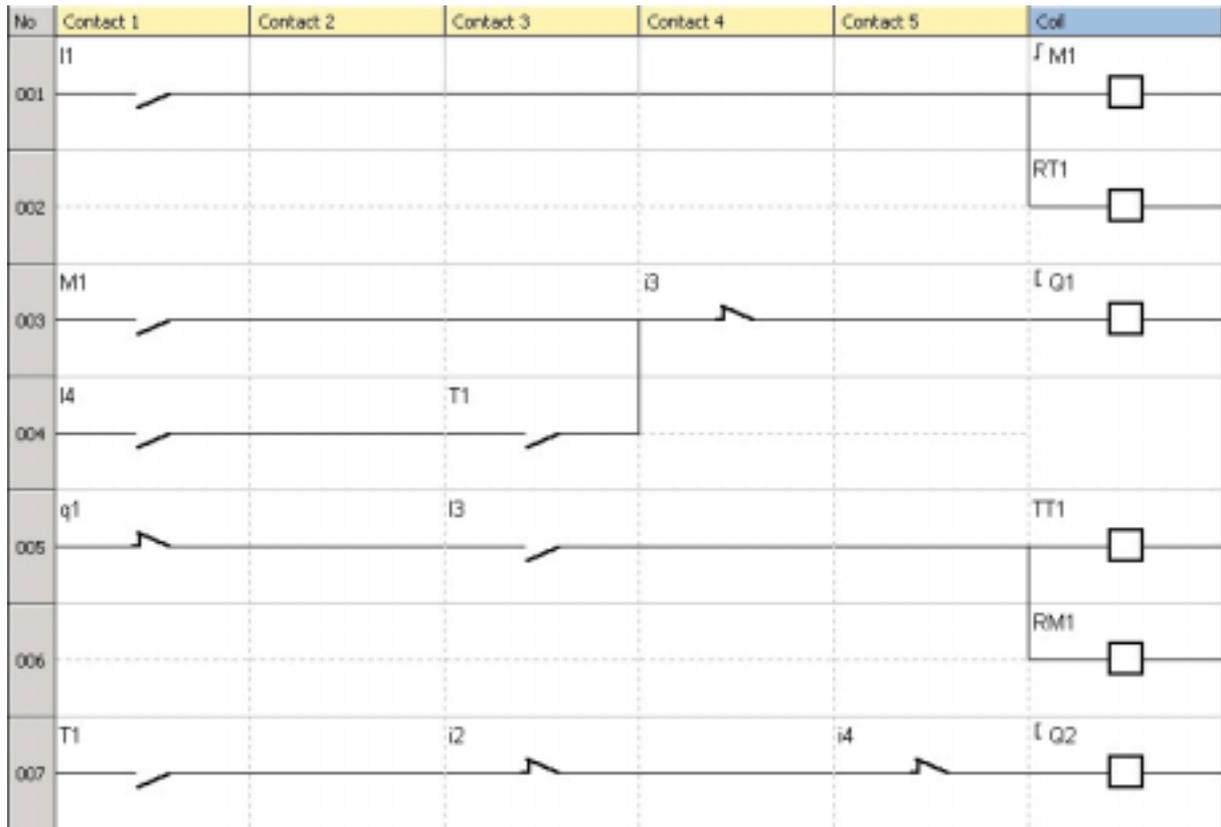
No specific condition.

SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Advantages of the application:

The safety feature of being able to stop gate opening or closing via the remote control signal is an essential advantage for this type of application.

Logic diagram:



Click on the link below to access the application:

[Access control, automatic gate](#)

1.4 UNDERGROUND CAR PARK CONTROL

Specifications:

We want to complete and centralize the control of the underground car park of an administration building.

Vehicle entrance/exit control: access is allowed by an automatic barrier. Users can access the car park during business hours: Monday through Friday from 8:30 a.m. to 5:30 p.m., Saturday from 9:30 to noon. However, it is possible to manually inhibit the blocking of the barrier by pressing on **Z4** (function restored by pressing on **Z2**) in case of an exceptional event.

Counting: The car park capacity is limited to 93 vehicles. A counter will block access to the car park if it is full and will control a light panel indicating "Car park Full". It is also possible to manually increase or decrease (in increments) the number of vehicles present in the car park (using **Z1** and **Z3**).

CO2 level: For safety reasons, a CO2 sensor indicates when the level is high and controls the operation of a fan (10 minutes).

Light: The lighting switches on for 2 minutes each time a vehicle enters the car park or whenever a pedestrian presses the switch. .

Description of the inputs/outputs:

<i>INPUTS:</i>	<i>OUTPUTS:</i>
I1 Vehicle entry	Q1 Indicates when the car park is full.
I2 Vehicle exit	Q2 Locks the entry barrier
I3,I4 Pushbuttons at pedestrian access points	Q3 Lightning
IB Carbon dioxide level sensor	Q4 Fan control
Z1 Manually increments the number of vehicles	
Z2 Resumes automatic entry control	
Z3 Manually decrements the number of vehicles	
Z4 Manual release of entry barrier	

Model Required:

Model with clock and analog inputs.

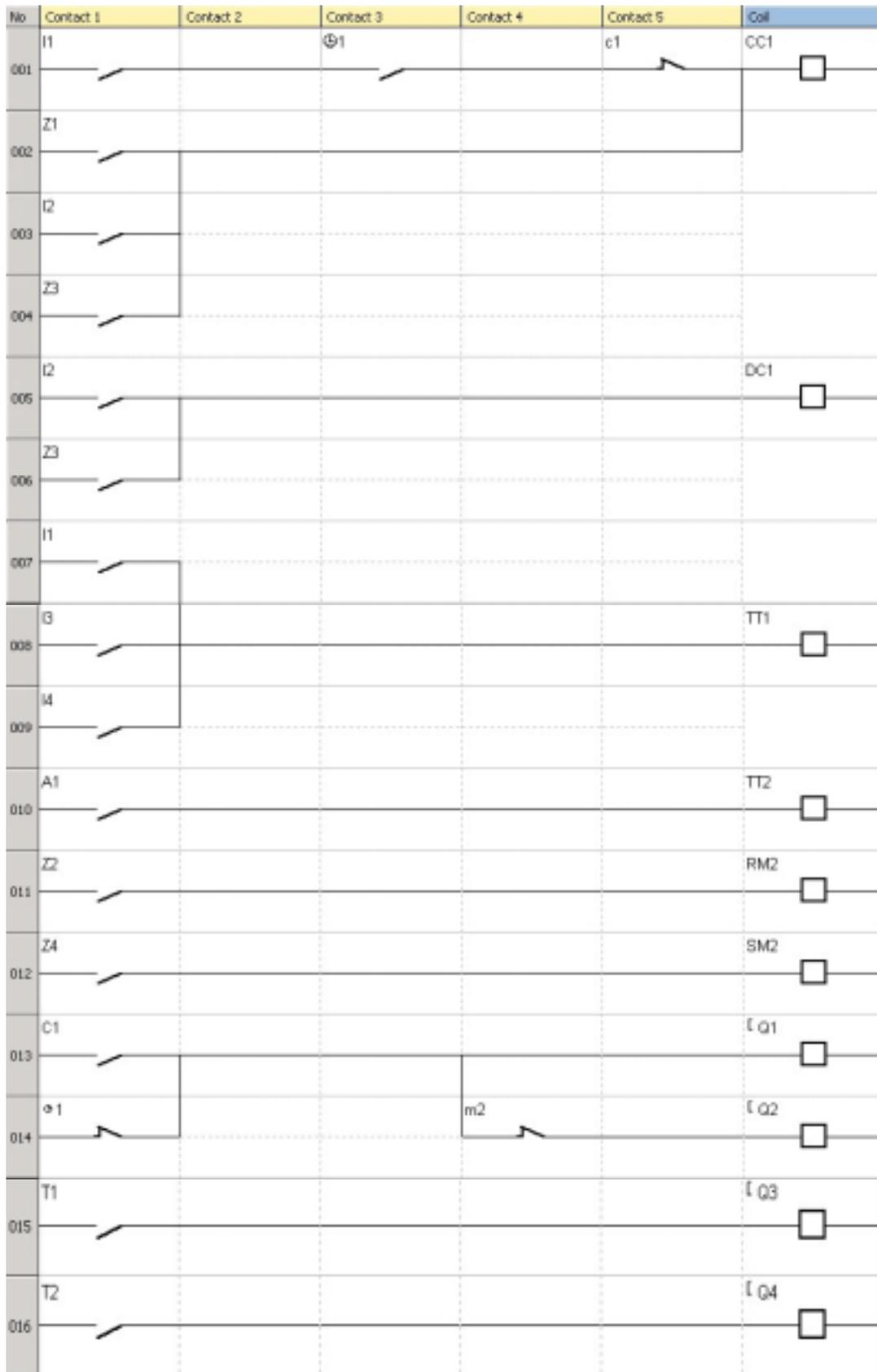
SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Advantages of the application:

Full car park control using a single logic module.

*Note: Use the floating pop-ups to simulate the variation of the level of CO2 (analog input **IB**) and to use the push-buttons. To call them up, click on the corresponding icons in the lower bar.*

Logic diagram:



Click on the link below to access the application:

[Underground car park control](#)

1.5 ROOM TEMPERATURE REGULATION

Specifications:

The ambient temperature of a room is controlled in the heat mode by a heater and a fan, and in the chill mode only by the fan. A heat sensor provides a 0-10 V signal.

A switch is used to deactivate temperature regulation.

The direct evolution of inputs and outputs can be monitored in a supervision window.

Description of the inputs/outputs:

INPUTS:	OUTPUTS:
I1 On/Off switch	Q1 Heater
I2 Mode selection	Q2 Fan
IB Ambient temperature (analog input)	
IC Setpoint (analog input)	

The temperature is supplied by a sensor with output voltage of 0 to 10 V.

Model Required:

Zelio Logic with analog inputs.

SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Program Description:

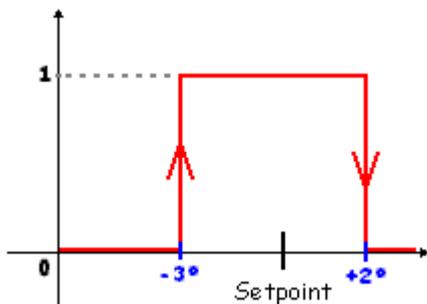
Input I1 =0 : regulation is off.

Input I1 =1 : Regulation is on.

Input I2 =0 : chill mode.

Input I2 =1 : heat mode.

Hysteresis:

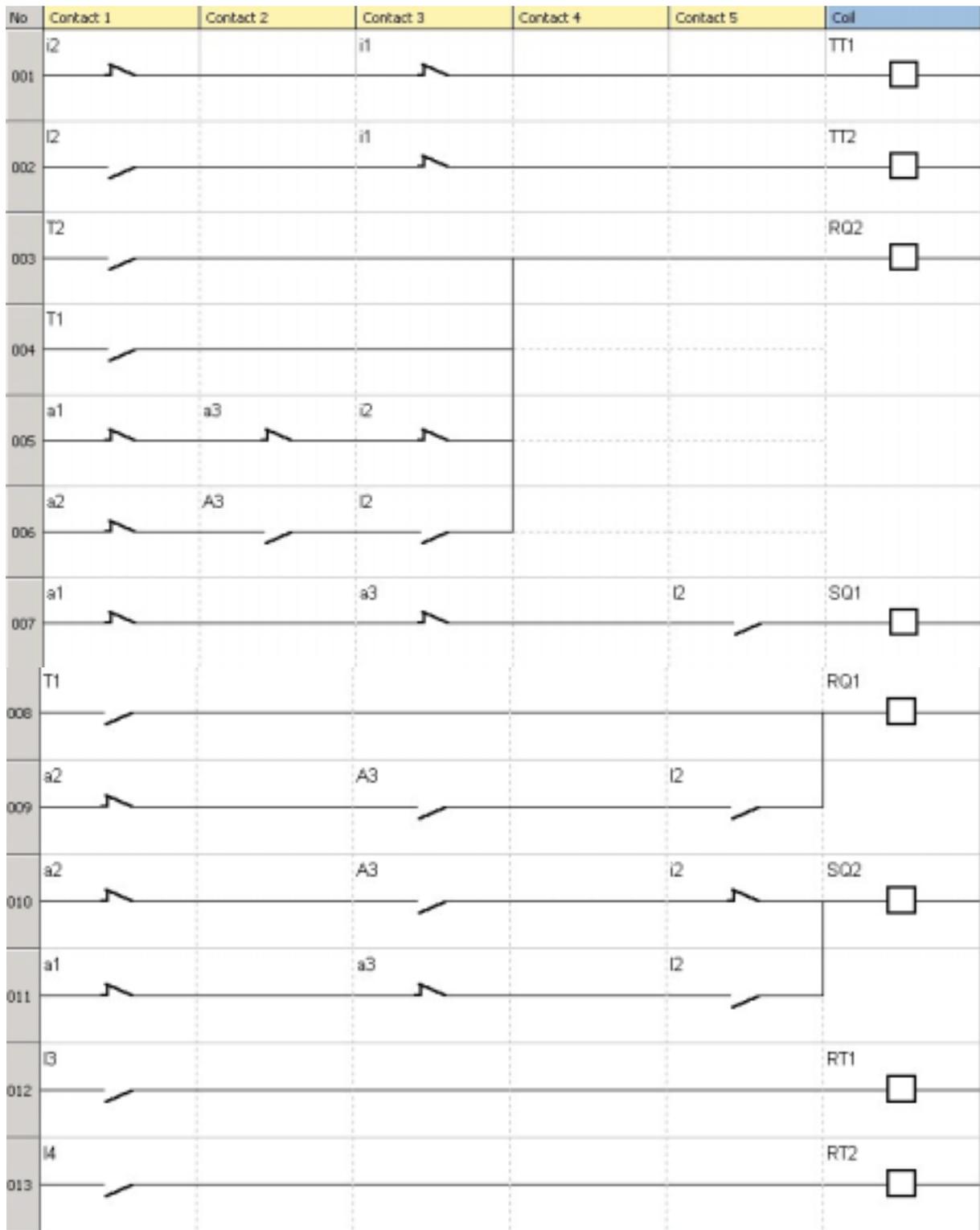


Advantages of the application:

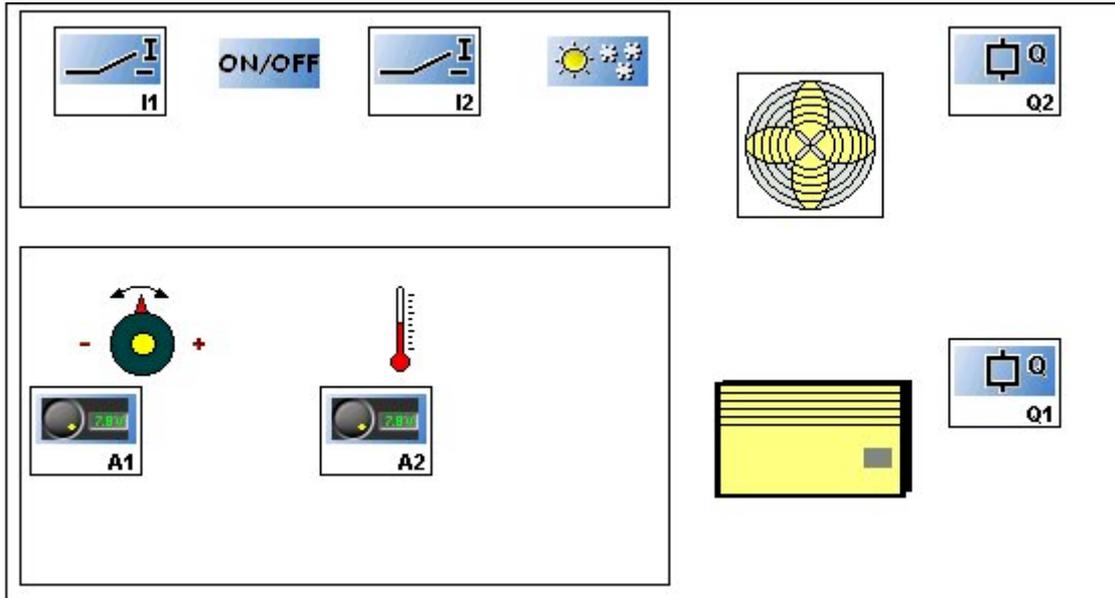
Use of 0-10 V analog inputs.

The supervision window.

Logic diagram:



Supervision window:



Click on the link below to access the application:

[Room temperature regulation](#)

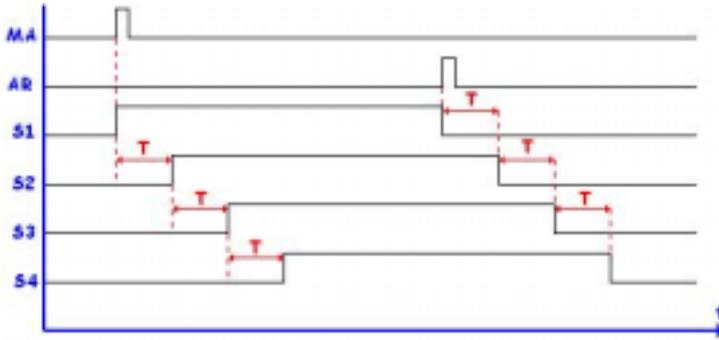
Note: to simulate this program, first adjust the setpoint using analog input IC then switch on the temperature regulation (I1=1, click on I1). If the chill mode is selected (I2=0), the fan will be activated as soon as the temperature exceeds the setpoint of 3°C and will stop when it drops 2°C below the setpoint. And conversely for the heat mode.

1.6 PROGRESSIVE HEATING OF BOILER ELEMENTS

Specifications:

To avoid over-consumption on boiler start-up, the heating elements are heated progressively, and stopped progressively when the boiler is stopped.

This operating principle is shown by the following timing diagram:



An “On” (**MA**) button authorizes the activation of the first heating element (**S1**). After a time-delay T , the second element (**S2**) starts up. After the same time-delay, the third elements starts up (**S3**), then the fourth element (**S4**) again after time-delay T . An “Off” (**AR**) button deactivates **S1**. The three other elements are progressively deactivated after time-delay T with each deactivation of the preceding element.

Description of the inputs/ouputs:

<i>INPUTS:</i>	<i>OUTPUTS:</i>
I1 On button	Q1 First heating element S1
I2 Off button	Q2 Second heating element S2
	Q3 Third heating element S3
	Q4 Fourth heating element S4

Model Required:

No specific condition:

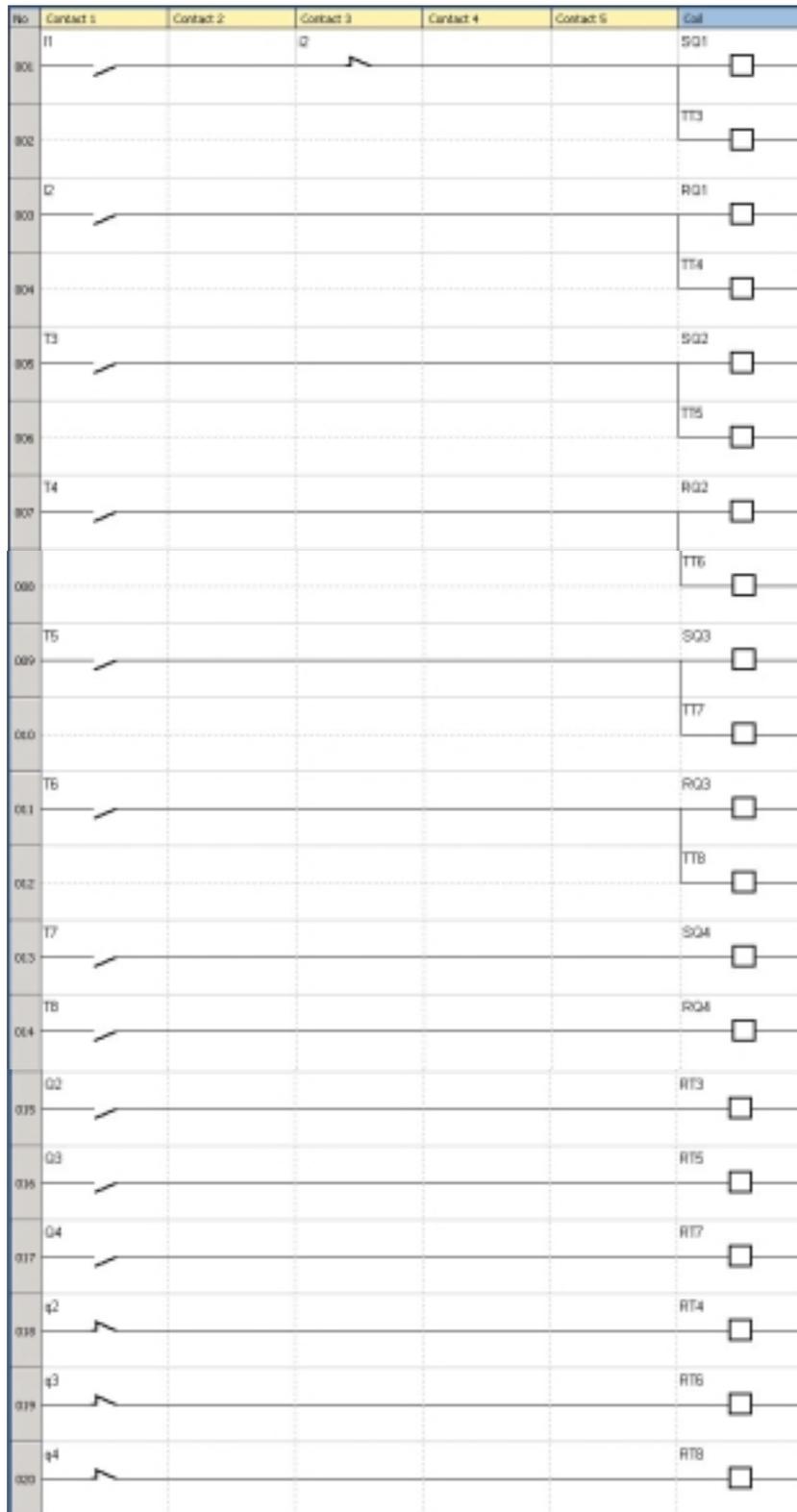
SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Program Description:

In principle, time delay T is identical for the activation/deactivation of all the heating elements. The program includes three **TIMER** function blocks. The function to perform according to the specifications requires entering the same time-delay value in the three blocks.

As a result, if the user wants to modify one of them, he/she will have to enter the new selection in the three blocks.

Logic diagram:



Click on the link below to access the application:

[Boiler elements](#)

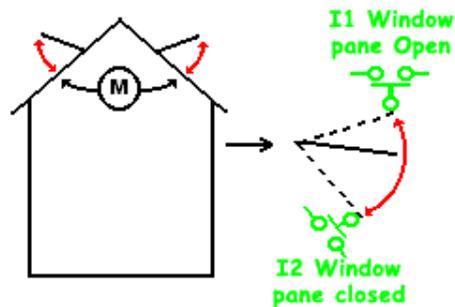
2 Applications in FBD language

2.1 GREENHOUSE AUTOMATIC VENTILATION PANE CONTROL

Specifications:

The owner of a greenhouse would like to acquire an installation to manage the opening and closing of the ventilation window panes located on the greenhouse roof.

The greenhouse has two window panes to provide ventilation. The opening of these window panes is controlled by a motor and 2 sensors that indicate whether the window panes are open or closed:

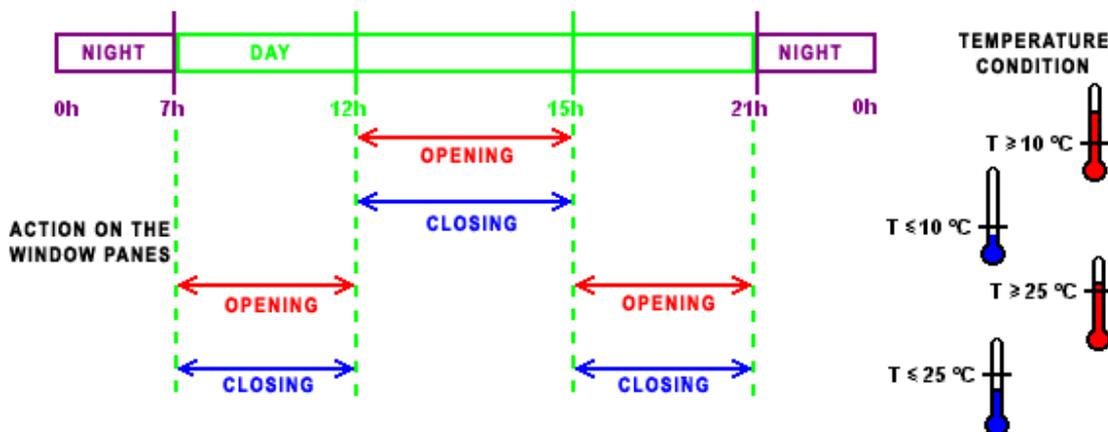


During the day, the window panes open to ventilate the structure from 12:00 to 15:00, at the time of day when, in principle, the temperature is the highest. However, if the temperature is less than 10°C, the window panes do not open, or when they are already open, they close.

In addition, the window panes open during the day when the temperature reaches 25°C. If the temperature falls below 25 °C, the window panes must close again.

Finally, at night, the window panes remain closed regardless of the temperature.

Summary diagram:



Description of the inputs/outputs:

INPUTS:	OUTPUTS:
I1 Opened window sensor	Q1 Opening of the window panes
I2 Closed window sensor	Q2 Closing of the window panes
IB Temperature (analog input)	

The temperature is supplied by a sensor with output voltage of 0 to 10 V.

Model Required:

Zelio Logic with clock and analog inputs.
 SR2 B121 BD (24 V DC) or SR2 B121 JD (12 V DC) for example.

Program Description:

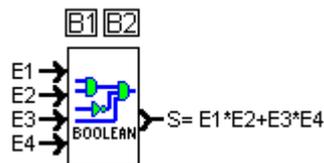
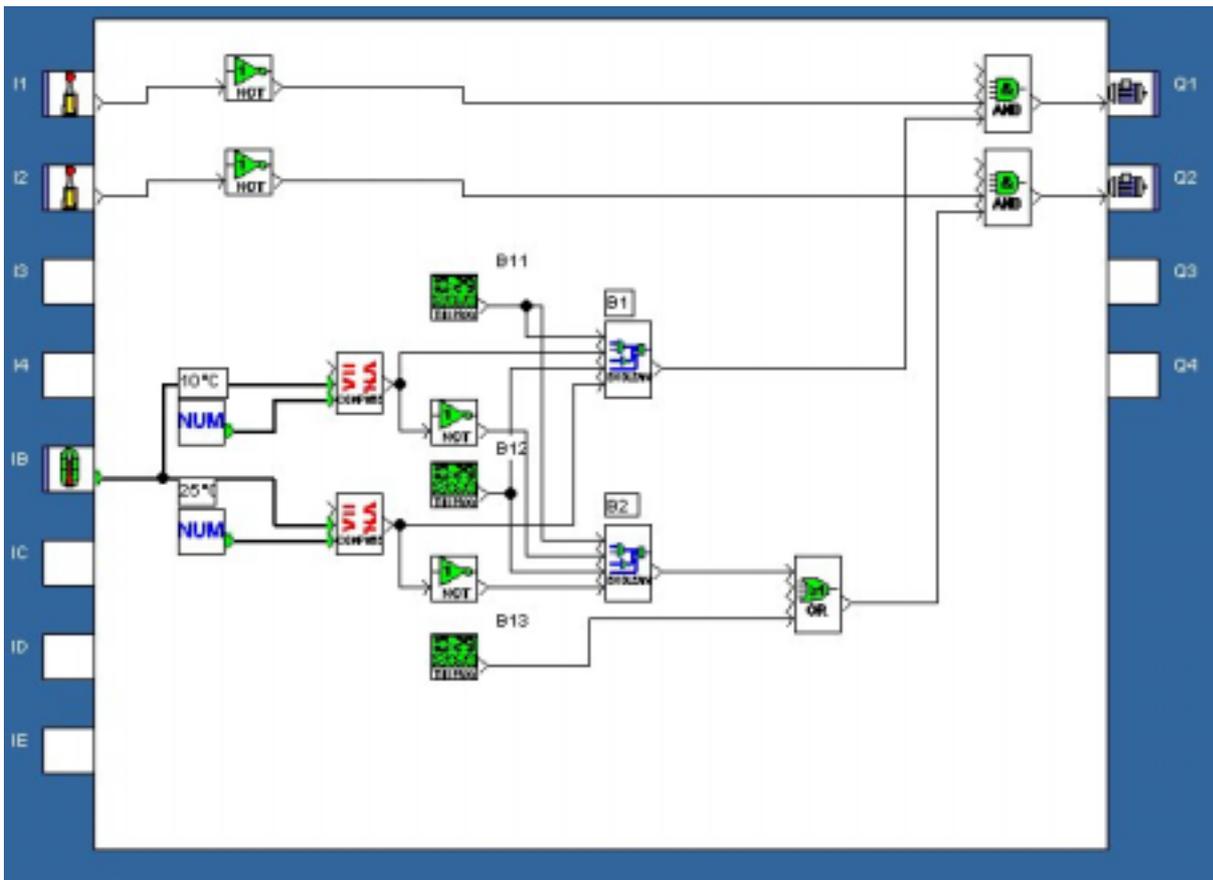
3 time ranges are used:

- Range 1: Night, from 21:00 to 07:00 (B13)
- Range 2: Daytime, from 7:00 a.m. to 12:00 p.m. and from 3:00 to 9:00 p.m. (B12)
- Range 3: Noon, from 12:00 to 15:00 (B11)

Advantages of the application:

The programmable logic function is used simplifying the diagram

Logic diagram:



Click on the link below to access the application:

[Greenhouse automatic ventilation pane control \(FBD\)](#)

2.2 INDOOR/OUTDOOR LIGHTING OF A HOME

Specifications:

A homeowner would like to install a system capable of controlling the lighting of a stairway and outdoor entrance providing access to the home.

Outdoor lighting: The circuit is activated every year from June 1st to October 1st and at night by a twilight switch. A sensor detects any passage and activates the outdoor lighting for 2 minutes.

Indoor lighting: Two pushbuttons are situated in the stairwell; one in the entrance, the other at the top of the stairs. Their function is identical.

- Time-delayed (30 seconds) lighting is obtained by quickly pressing one of the buttons. The timer can be inhibited by renewed action on one of the buttons.
- Permanent lighting is activated if one button is depressed for at least 2 seconds. A quick press stops it.

Table of inputs/outputs:

<i>INPUTS:</i>	<i>OUTPUTS:</i>
I1 Passage sensor	Q1 Outdoor lighting
I2 Twilight switch	Q4 Indoor lighting
I3 Pushbutton	
I4 Pushbutton	

Model Required:

Zelio Logic with clock:

SR2 B121 BD (24 VDC) for example.

Program Description:

Programming is possible at two levels.

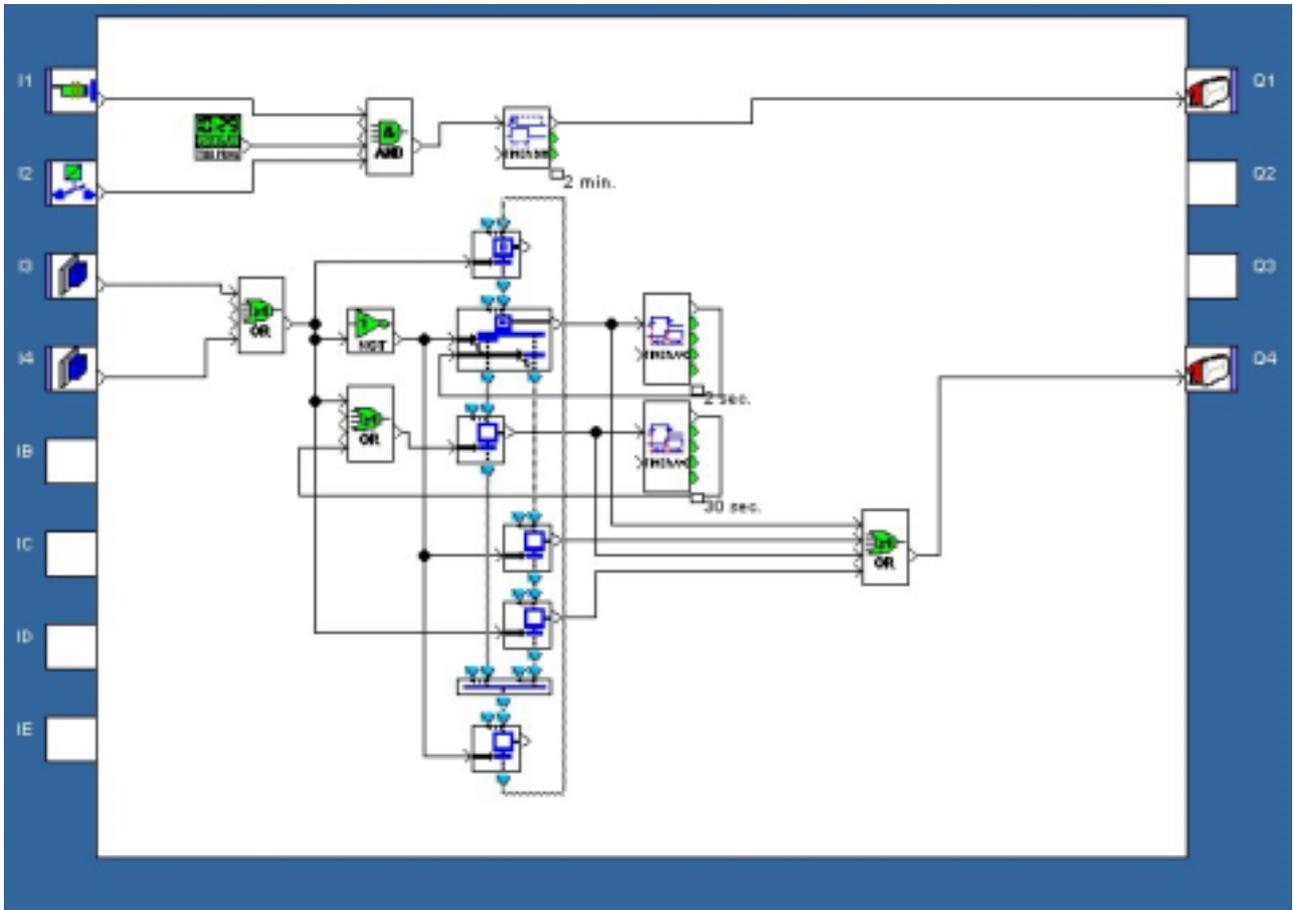
Level 1 : Program satisfying the specifications.

Level 2: Use of SFC/Grafset functions

Advantages of the application:

It is possible to handle the application with sequential functions.

Logic diagram Level 2 (SFC/Grafcet) :



Click on the link below to access the application:

[Indoor/Outdoor lightning of a home - level 2 \(SFC-Grafcet\)](#)

2.3 ACCESS CONTROL, AUTOMATIC GATE

Specifications:

A homeowner wants access to his residence to be controlled by an automatic gate equipped with a dual direction (opening and closure) motor.

Opening: Whether the gate is closed or in an intermediate position, the remote control signal causes the full opening of the gate. During the opening process, each new action on the remote control stops or restarts the motor.

As soon as the gate is fully open, a 4-second time delay delays its closure.

Closure: During the closing process, if the remote control is activated or if the sensor detects a passage, the gate is opened. As long as the sensor is activated, (vehicle stopped in the passage way for example), the gate remains fully open.

Description of the inputs/outputs:

<i>INPUTS:</i>	<i>OUTPUTS:</i>
I1 Remote control	Q1 Gate opening
I2 Gate closed position	Q2 Gate closure
I3 Gate closed position	
I4 Passage sensor	

Model Required:

No specific condition.

SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Program Description:

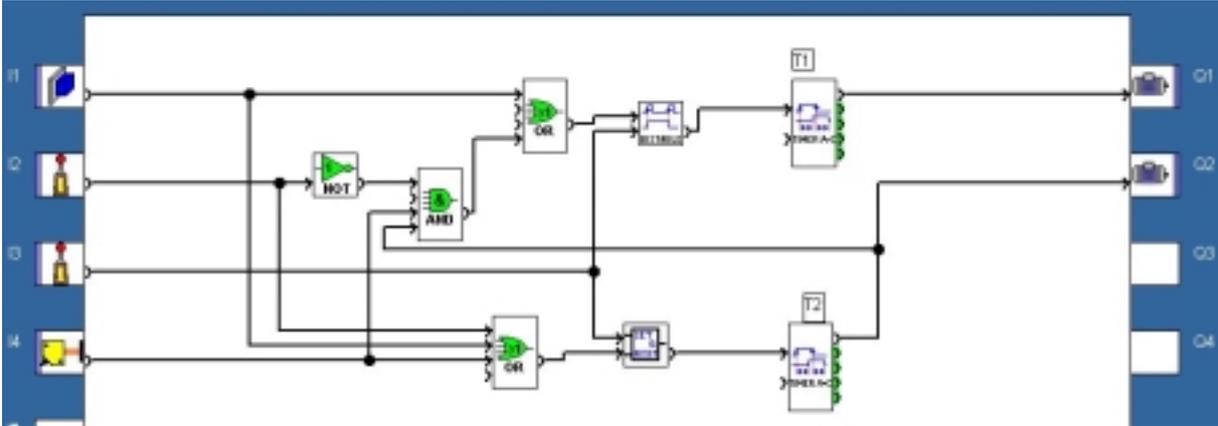
The T1 timer (A-C Timer A-C) is used to switch the motor in the opening direction 0.5 seconds after the inhibition of closure. This avoids any short-circuit and mechanical jerk. Timer T2 (A-C Timer) fulfills two simultaneous functions. The 4-second triggering delay maintains the gate in the open position before beginning to closing motion.. The 0.2 second triggering delay allows the activation conditions of the "AND" logic block output to be verified.

Advantages of the application:

The safety feature of being able to stop gate opening or closing via the remote control signal is an essential advantage for this type of application.

The parallel connection to the motor terminals allows the addition of a light signal indicating any movement of the gate.

Logic diagram:



Click on the link below to access the application:

[Access control, automatic gate](#)

2.4 ROOM TEMPERATURE REGULATION

Specifications:

The ambient temperature of a room is controlled in the heat mode by a heater and a fan, and in the chill mode only by the fan. A temperature sensor, via a converter, provides a 0-10V signal. A switch is used to deactivate temperature regulation.

Screen display:

The heat or chill mode is displayed

The ambient temperature and setpoint are displayed.

A trigger function is provided to set up regulation that takes into account a hysteresis of +2°C from start to stop and -3°C from stop to start.

Description of the inputs/outputs:

INPUTS:	OUTPUTS:
I1 On/Off switch	Q1 Heater
I2 Mode selection	Q4 Fan
IB Ambient temperature (analog input)	
IC Setpoint (analog input)	

The temperature is supplied by a sensor with output voltage of 0 to 10 V.

Model Required:

Zelio Logic with analog inputs.

SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Program Description:

Input I1 =0 : regulation is off.

Display example:

OFF

0017.2

InputI1 =1 : Regulation is on.

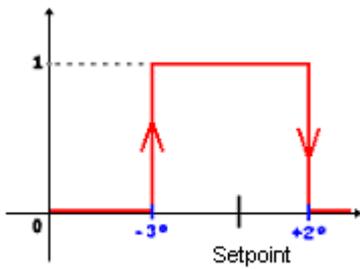
Display example:

heat mode.

0020.0 (setpoint display)

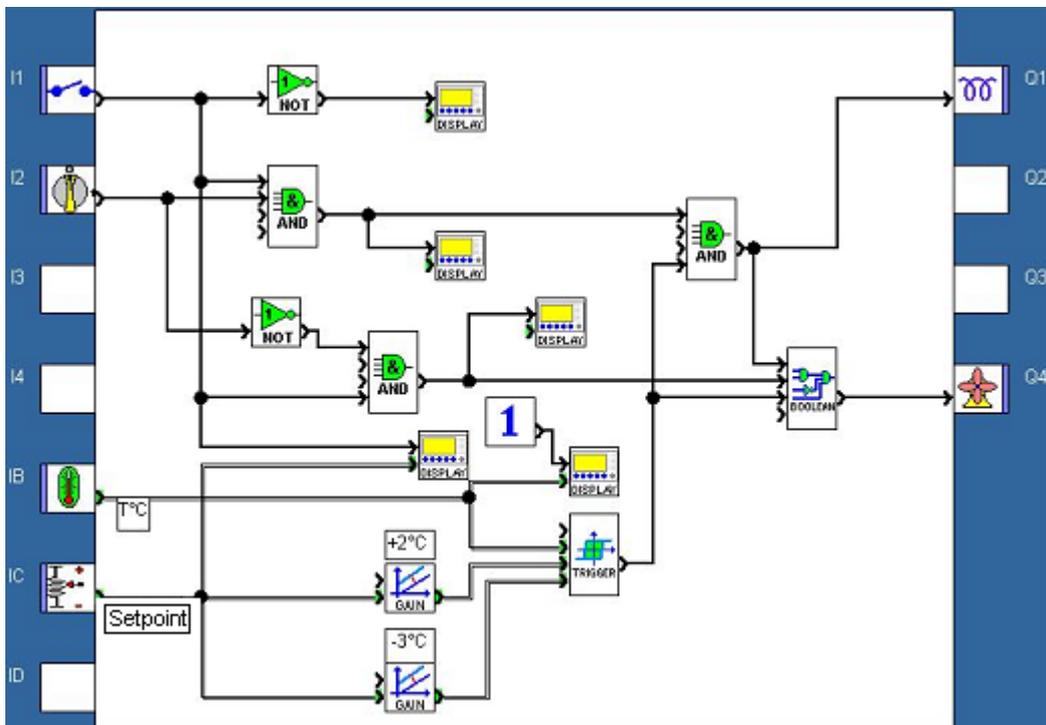
0017.2 (temperature display)

Hysteresis:



Advantages of the application:
Use of 0-10 V analog inputs.

Logic diagram:



*Note 1: When the module is on, select **FBD DISPLAY** in the main menu of the module to view the active text blocks on the screen. In a simulation, it is possible to call up the front panel by selecting **3 Front Panel** in the **Window** menu.*

*Note 2: It will probably be necessary to wire additional gain functions after inputs **IB** and **IC**.*

Click on the link below to access the application:

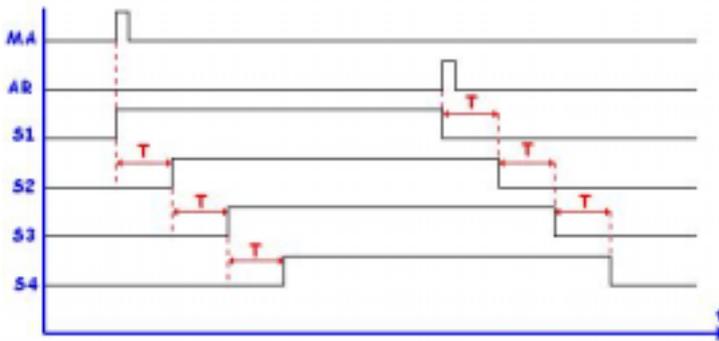
[Room temperature regulation](#)

2.5 PROGRESSIVE HEATING OF BOILER ELEMENTS

Specifications:

To avoid over-consumption on boiler start-up, the heating elements are heated progressively, and stopped progressively when the boiler is stopped.

This operating principle is shown by the following timing diagram:



An “On” (MA) button authorizes the activation of the first heating element (S1). After a time delay T, the second element (S2) starts up. After the same time-delay, the third elements starts up (S3), then the fourth element (S4) again after time-delay T. An “Off” (AR) button deactivates S1. The three other elements are progressively deactivated after time-delay T with each deactivation of the preceding element.

Description of the inputs/ouputs:

INPUTS:	OUTPUTS:
I1 On button	Q1 First heating element S1
I2 Off button	Q2 Second heating element S2
	Q3 Third heating element S3
	Q4 Fourth heating element S4

Model Required:

No specific condition.

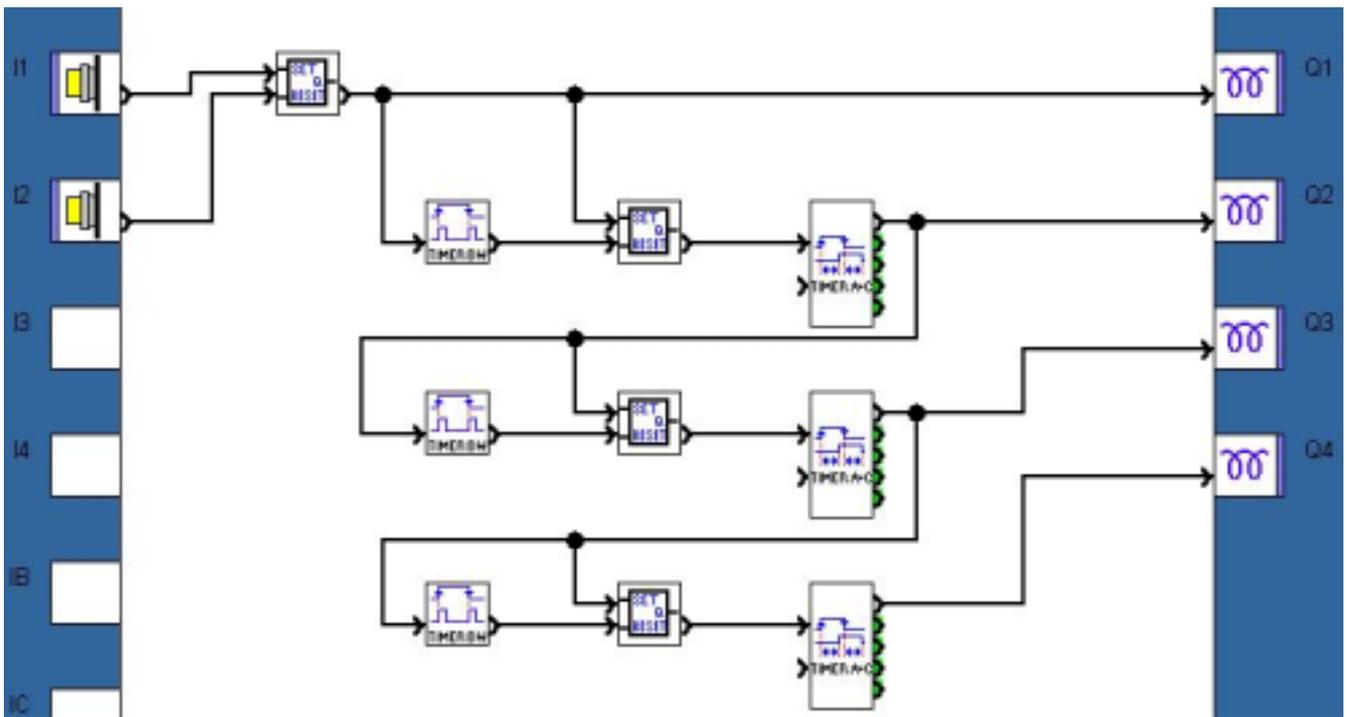
SR2 B121 BD (24 V DC) or SR2 B121 JD (12 V DC) for example.

Program Description:

In principle, time delay T is identical for the activation/deactivation of all the heating elements. The program includes three TIMER function blocks. The function to perform according to the specifications requires entering the same time-delay value in the three blocks.

As a result, if the user wants to modify one of them, he/she will have to enter the new selection in the three blocks.

Logic diagram:



Click on the link below to access the application:

[Progressive heating of boiler elements](#)

2.6 SCHOOL BELL

Specifications:

A high school wants to control the daily bell and alarm system using the same device. The bell rings from Monday to Friday for one minute except during the holidays. The “alarm” mode is active during the holidays, on weekends, and at night Monday through Friday. The alert is given for 1 minute by an audio signal alternating 2 s ON, 1 s OFF, and by an indicator light activated by a motion detector. It must be possible to reset the alarm.

Advantages of the application:

The annual clock, available on FBD, allows school holidays and legal holidays to be taken into account.

Description of the inputs/outputs:

INPUTS:	OUTPUTS:
I1 Alarm : On/off	Q1 Ringing
I2 Motion detector	Q2 Indicator light
I3 Alarm: Reset	

Model Required:

Model with annual clock:

SR2 B121 BD (24 V DC) or **SR2 B121 JD** (12 V DC) for example.

Program Description:

To program the three clocks, copy or adapt the parameters of figures 1, 2 and 3. The logic block unites the activation conditions of the “alarm” mode according to the equation :

INPUT				OUTPUT
1	2	3	4	
Time 2	I1	I2	Time 3	
0	1	1	1	1

Figure 1:

TIME PROG (DAILY, WEEKLY AND YEARLY PROGRAMMER)				
Comments Parameters Summary				
Number	Change t	Daily	Day(s)	Week(s)
00	ON	08:29	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
01	OFF	08:30	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
02	ON	12:00	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
03	OFF	12:01	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
04	ON	13:29	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
05	OFF	13:30	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
06	ON	17:00	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
07	OFF	17:01	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5

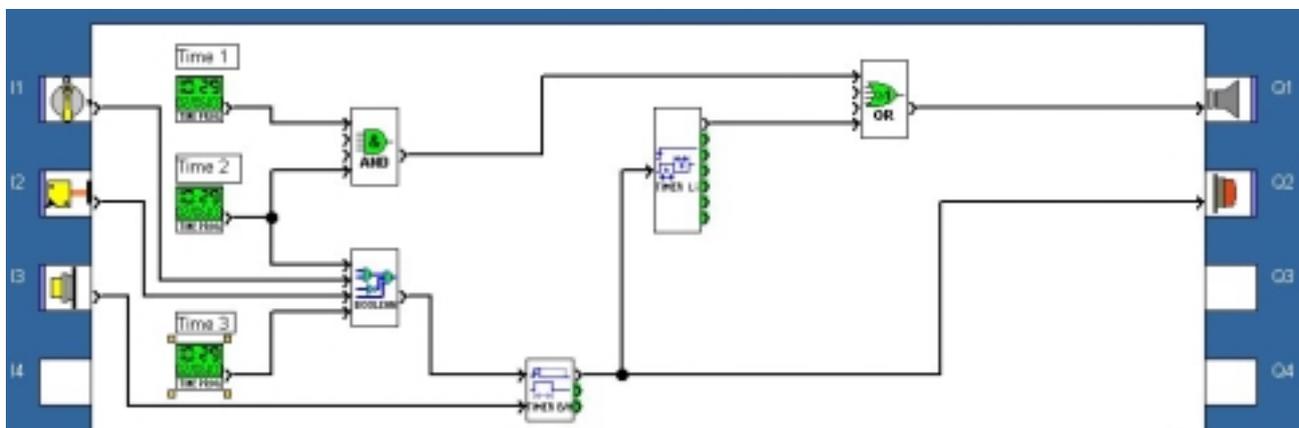
Figure 2:

TIME PROG (DAILY , WEEKLY AND YEARLY PROGRAMMER)				
Comments		Parameters		Summary
Number	Change to	Daily	Day(s)	Week(s)
00	ON	00:00	Every year 2 January	-
01	OFF	00:00	Every year 30 June	-
02	ON	00:00	Every year 2 September	-
03	OFF	00:00	Every year 24 December	-

Figure 3:

TIME PROG (DAILY , WEEKLY AND YEARLY PROGRAMMER)				
Comments		Parameters		Summary
Number	Change to	Daily	Day(s)	Week(s)
00	OFF	07:00	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5
01	ON	22:00	MON,TUES,WEDS,THURS,FRI	1,2,3,4,5

Logic diagram:



Click on the link below to access the application:

[School bell](#)