Zelio logic tutorial

1 The Products

Congratulations! You have chosen one of the following Zelio products:

2 Environment

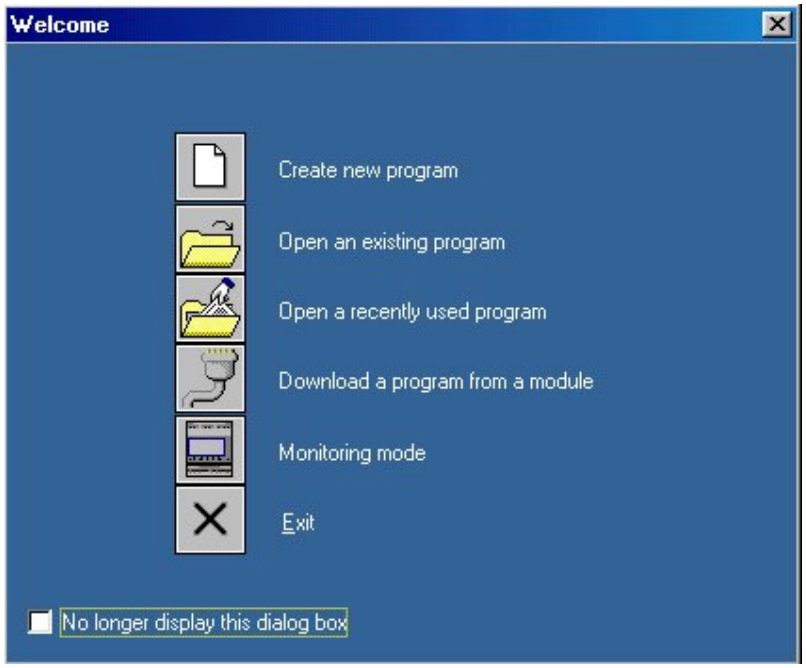
Zelio Logic is programmable using the Zelio Soft program or in Direct Entry Mode (Ladder language). Zelio Soft allows you to program your software in **FBD language** or in **Ladder language.** You must be connected to your PC in order to use the software program.

Use an **SR2CBL01** cord to connect to your PC's serial port.

3 Introduction to Zelio Soft

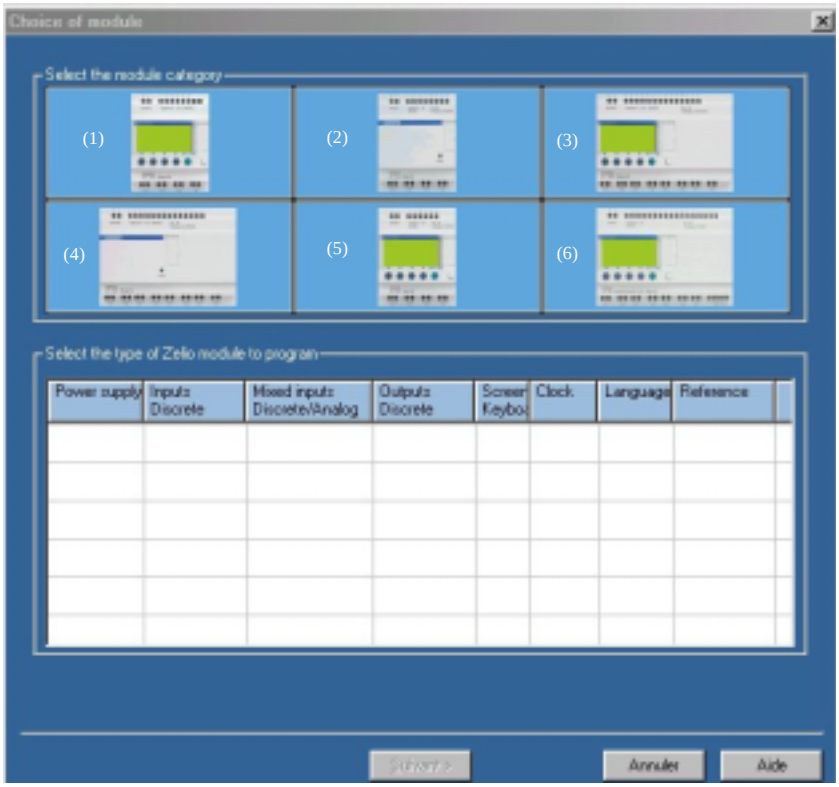
3.1 STARTING THE PROGRAM

When the Zelio Soft program is launched, the following window appears:



Click on **Create a new program** to start or choose **New** in the **File** menu if the program has already been launched.

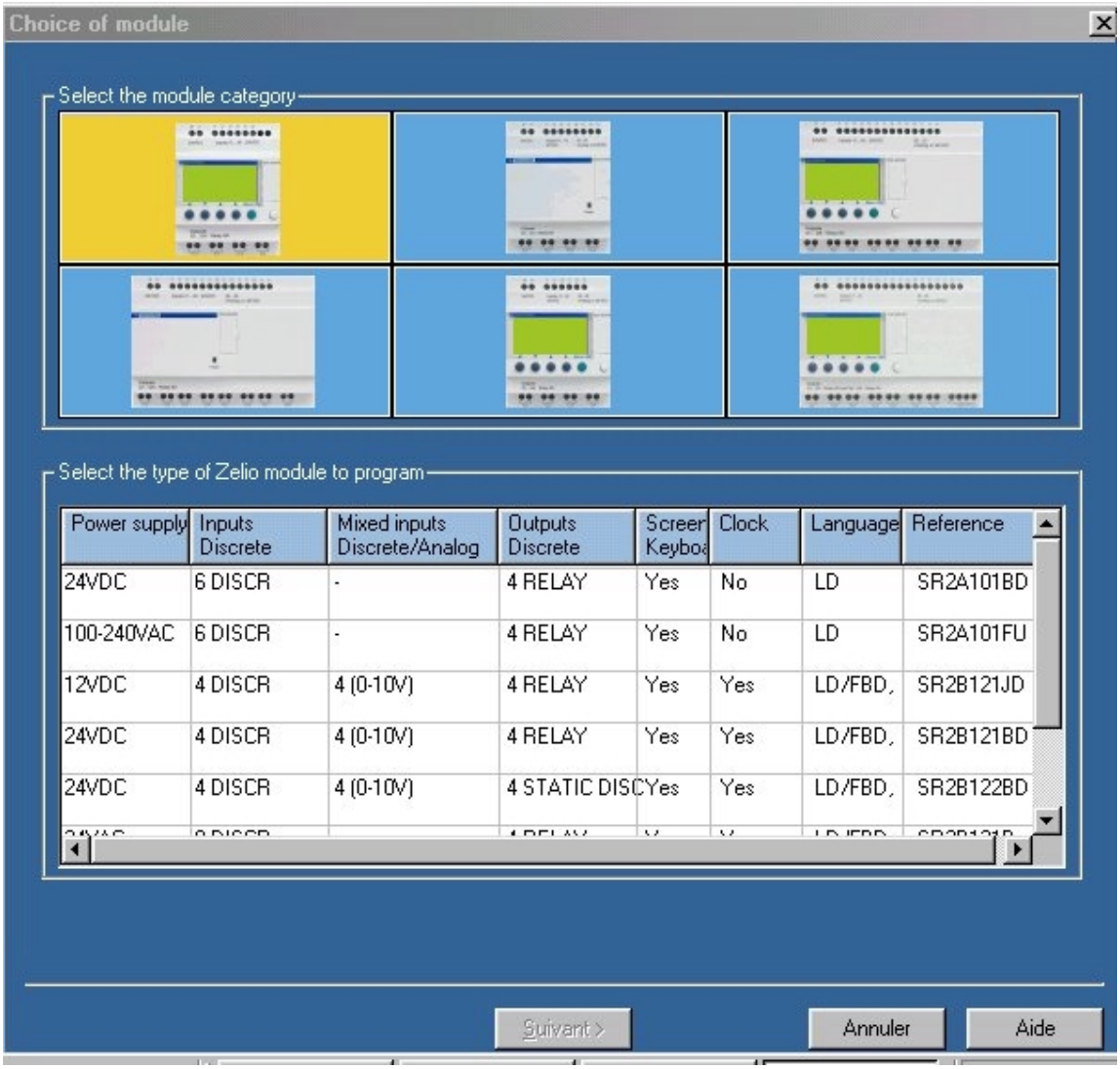
The smart relay option window now appears:



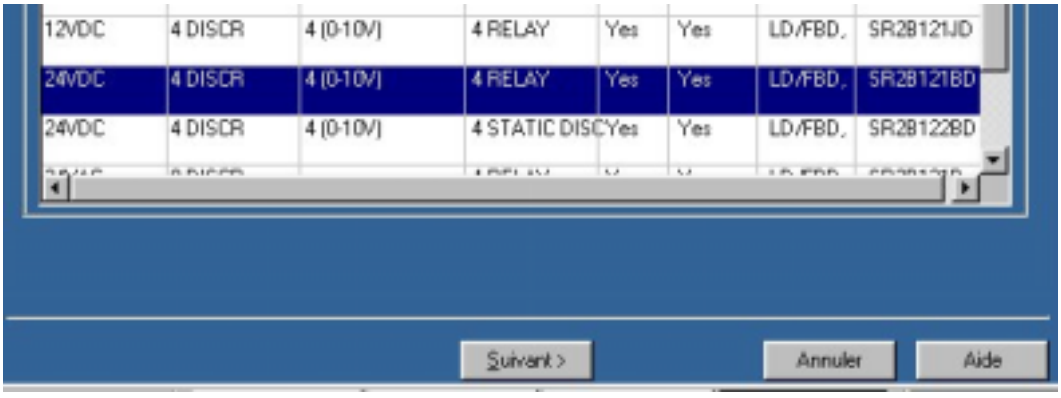
In this example, we will choose the **SR2 B121 BD** module:

Click on the category **(1)** 10/12_I/O_WITHOUT_EXTENSION

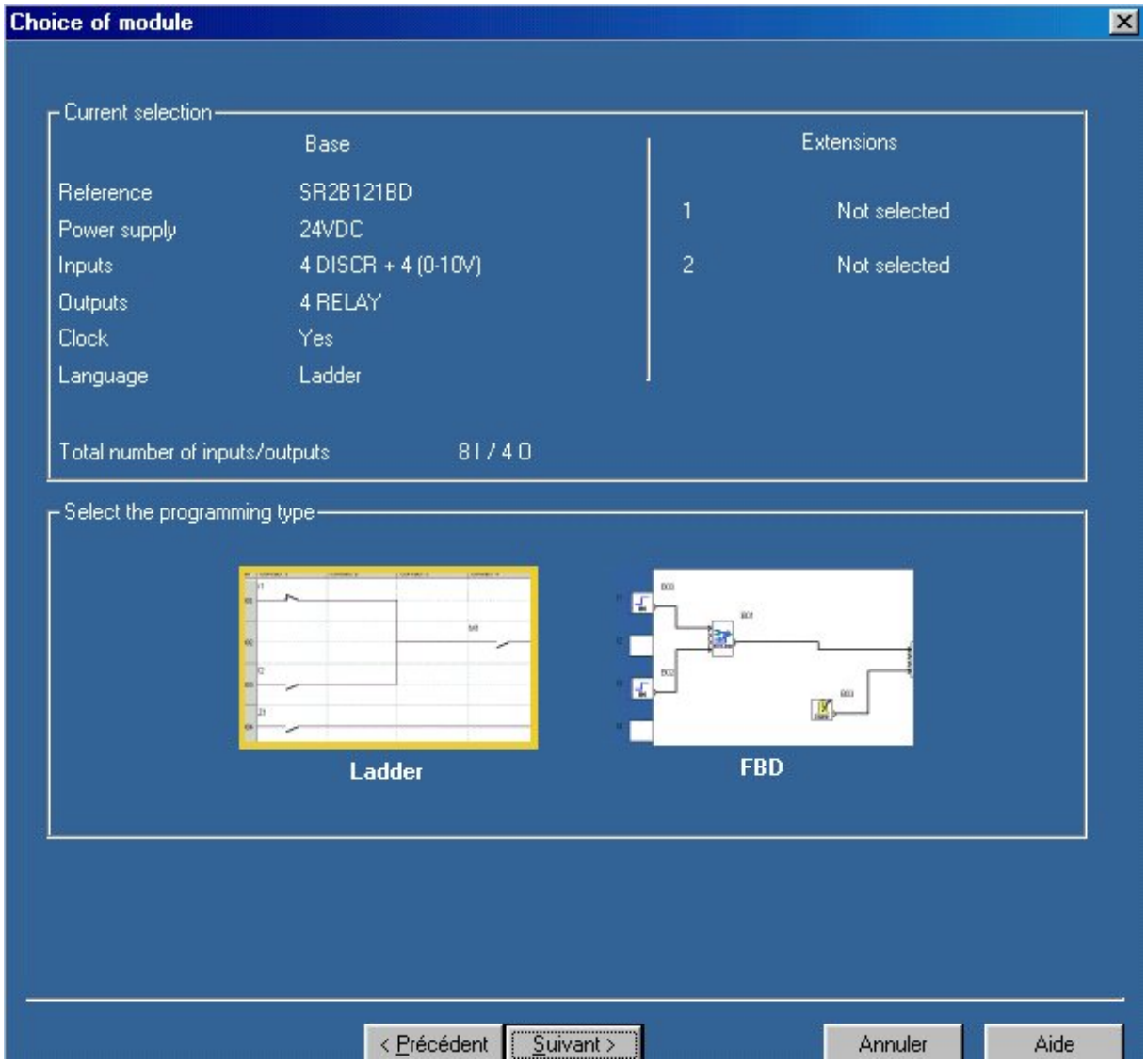
The selected category is highlighted in yellow and followed by the list of corresponding modules:



Click on the corresponding line to select the **SR2 B121 BD** module:



Then click on **Next**.
The program type option screen now appears:



Ladder language is selected by default (yellow outline), click on **Next** to program in Ladder. Click on the FBD icon then on **Next** to program in FBD.
Refer to 3.2 (Ladder language) or 3.3 (FBD) for an example.

3.2 EXEMPLE IN LADDER LANGUAGE
3.2.1 Program Editing:

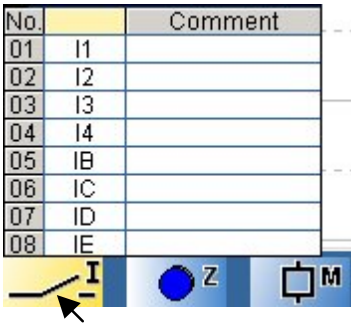
We are going to use the following example:

I1————————Q1

Input **I1** is connected to output **Q1**, which will be in active status (coil in contact mode).

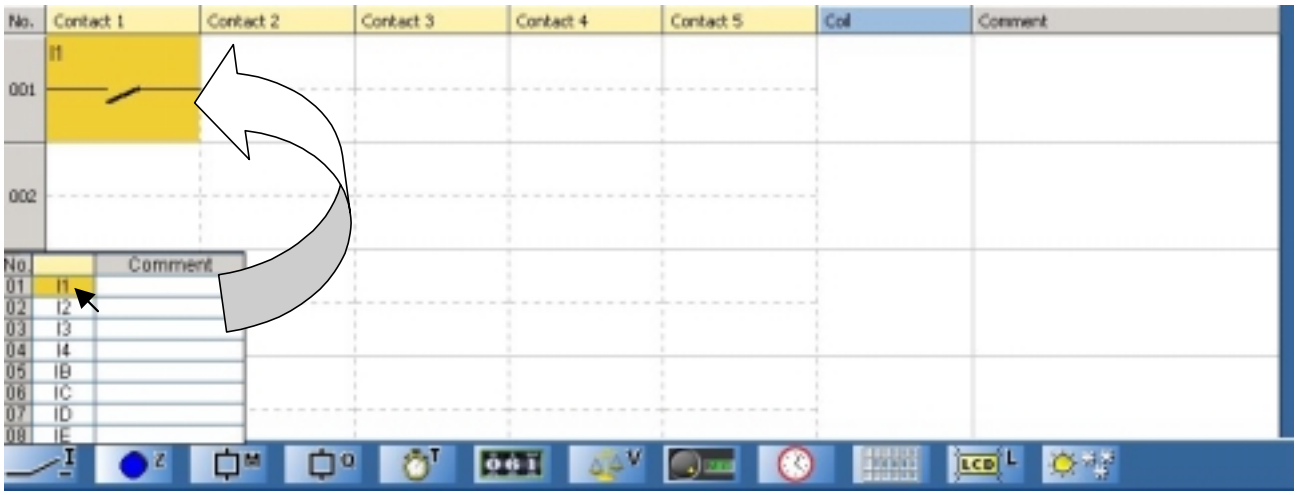
To reproduce this example in the wiring sheet:

- Move the mouse arrow over the **Discreet Input**  icon in the lower left corner:



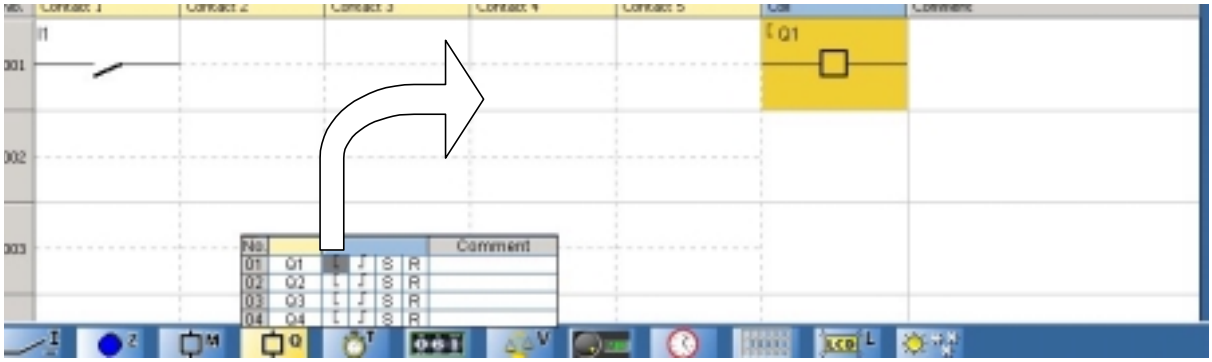
A chart with the different contact possibilities (**I1** à **IE**) appears.

Select contact **I1** in the chart by clicking and dragging the contact to the first cell in the upper left corner of the wiring sheet. Release the mouse button: Contact **I1** is now

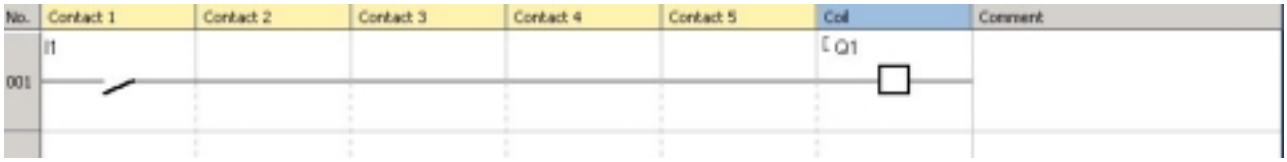


- Now move the mouse arrow over the **Discreet Output**  icon at the bottom of the screen:
  A chart with the different contact or coil possibilities appears.

- Select the coil **[** in the first line of the chart by clicking and dragging the appropriate coil to the first line of the coil column in the wiring sheet. Release the mouse button: Coil **[Q1** is now in place.



Wire the contact to the coil by clicking on the corresponding dotted lines.



3.2.2 Program simulation

Simulate the program chosen by clicking on the simulation icon in the upper right corner:

The chosen program is now compiled and the simulation screen appears.
Next click on the **RUN** icon to simulate the module start-up:

A contact or a coil appears in blue if inactive (**0**) and in red if active (**1**).
Click left to force input
Click on the **I1** contact to activate. The **Q1** coil is now activated. When you click a second time on **I1** to disactivate, **Q1** is also disactivated.

3.2.3 Program transfer

Power on the module and connect it to the computer before transferring the program:

- Click on the corresponding icon to return to **Edit mode**:

- In the **Transfer** menu, select **Transfer Program** then click on **PC>MODULE.**

*Note 1: You cannot write in the module when it is running. Click on **STOP Module** in the **Transfer** menu to stop the module.*

*Note 2: If the module connected to the computer is not the module selected when starting the program, you may select another module by clicking on **Module/programming option** in the **Module** menu.*

Note 3: When you have loaded a program in FBD in the preceding module (or when you first use it), the program should update the module firmware. You will be offered the option to update during transfer.

After confirmation, the program is transferred to the module.

You can then test the program that is in the module by starting it up (in the application: Click on **RUN Module** in the **Transfer** menu).

As in the simulation, if the Zelio Logic **I1** input is active, **Q1** will be active, and if the **I1** is inactive, so is **Q1**.

3.2.4 Monitoring Mode

When the module is connected to the PC, it is possible to run it in real-time with the program.

Note: Monitoring mode is only possible when the program contained in the module is identical to that in the application.

- Click on the corresponding icon to select Monitoring mode:

Then click **RUN** to start the module. As in simulation mode, click on the contacts to activate (a left click on the mouse forces the entry status). The contacts are then activated in real time on the module.
For example, click on **I1** to activate the **Q1** coil on the screen (red color) and on the module.

3.2.5 Moving around the module

Use the ▲ and ▼ buttons to navigate the different module menus. The selected function flashes. To enter the function, click on **Menu/Ok**. Click on ◀ to return to the previous menu. The **Shift** key (white key) will display additional functions, in particular when performing front panel programming.

For example, find the program transferred to the module screen when the module is in OFF mode (STOP Module): In the main menu, select **PROGRAMMATION** using the ▲ and ▼ keys (the selected word will flashes). Press **Menu/OK** to confirm. You may now visualize the chosen program. Double click on **Menu/Ok** to return to the previous menu.

3.3 EXEMPLE IN FBD
3.3.1 Program Editing

If you performed the previous example in Ladder language (3.2), select **New** in the **File** menu to start a program in FBD.

We are going to use the following example:

I1————————Q1

Input **I1** is connected to discrete output (TOR) **Q1** (Relay).

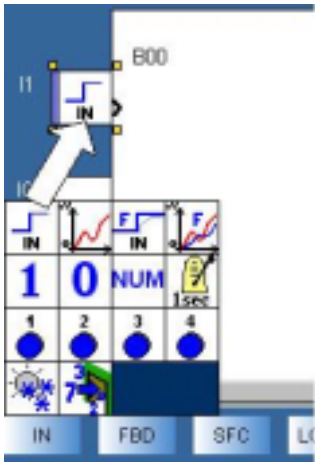
To reproduce this example in the wiring sheet:

- Move the mouse arrow over the **IN** 

icon in the lower left corner:

A chart with the different input-type possibilities appears.

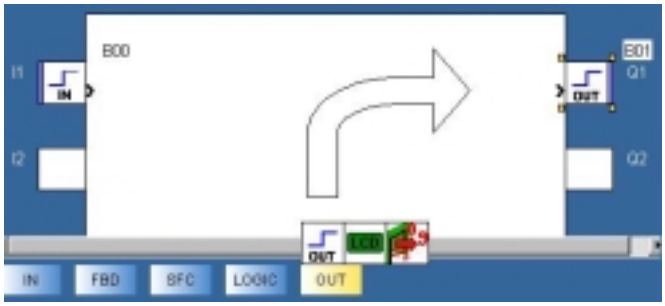
Select the **discreet entry** icon in the chart by clicking and dragging the icon to cell **I1** in the upper left corner of the wiring sheet.



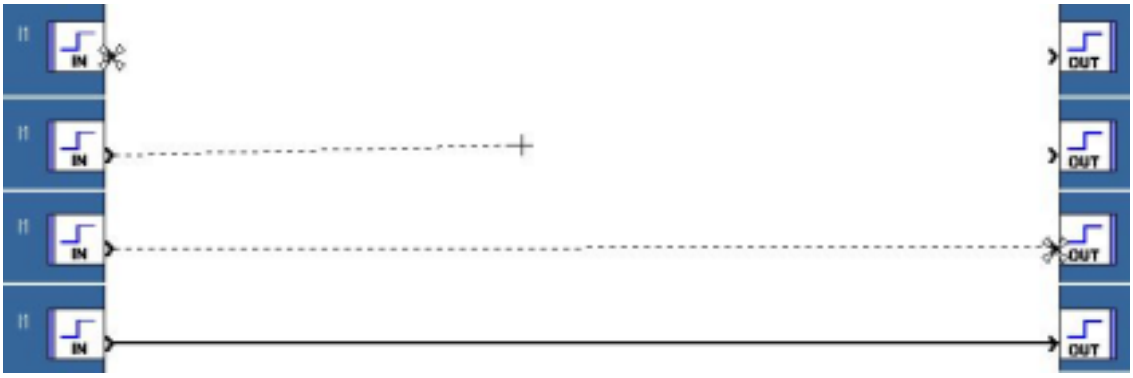
- Now move the mouse arrow over the **OUT** 

icon at the bottom of the screen.
A chart with the different output-type possibilities appears.

Select the **TOR (discreet output)** icon by clicking and dragging the icon to the **Q1** cell in the upper right corner of the wiring sheet. Release the mouse button: output **Q1** is now in place.



Connect the wiring from **I1** to **Q1**: Point to output > for **I1** : the arrow changes to a cross. Now click and drag the icon over to input **>** for **Q1**, until the arrow again changes to a cross, then release the button:



3.3.2 Program simulation

Click on the simulation icon in the upper right to simulate the program chosen:

The chosen program is now compiled and the simulation screen appears.
Next click on the **RUN** icon to simulate the module start-up:

A blue input or output indicates **OFF** (**0**), red indicates **ON** (**1**).
Click left to force input.
Click once on the **I1** input for Output **Q1 ON.** Click a second time on **I1**, to return **Q1** to **OFF**.

3.3.3 Program transfer

Power on the module and connect it to the computer before transferring the program:

Click on the corresponding icon to return to **Edit mode**:

- In the **Transfer** menu, select **Transfer Program** then click on **PC>MODULE.**

*Note 1: You cannot write in the module when it is running. Click on **STOP Module** in the **Transfer** menu to stop the module.*

*Note 2: If the module connected to the computer is not the module selected when starting the program, you may select another module by clicking on **Module/programming option** in the **Module** menu.*

Note 3: When you have loaded a program in Ladder language in the preceding module (or when you first use it), the program should update the module firmware. You will be offered the option to update during transfer.

After confirmation, the program is transferred to the module.

You can then test the program that is in the module by starting it up (in the application: Click on **RUN Module** in the **Transfer** menu).

As in the simulation, if the Zelio Logic **I1** input is **ON**, **Q1** will be **ON**, and if **I1** is **OFF**, so is **Q1**.

3.3.4 Monitoring Mode

When the module is connected to the PC, it is possible to run it in real-time with the program.

Note: Monitoring mode is only possible when the program contained in the module is identical to that in the application.

Click on the corresponding icon to select Monitoring mode:

Then start the module by clicking on **RUN**. Just as in simulation, you may activate the inputs by clicking on them, they are then activated in real time on the module.
The forcing of input may be made by a left click of the mouse. For example, if you click on **I1,** the **Q1** output will be **ON** on the screen (red color) and on the module.

3.3.5 Moving around the module

You may move around the different module menus by using the ▲ and ▼ buttons. The selected function flashes. To enter the function, click on **Menu/Ok**. Click on ◀ to return to the previous menu. The **Shift** key (white key) will show additional functions.
For example, to change the module language: from the main menu, go to **LANGUAGE** using the ▲ and ▼ (the selected word will blink). Press **Menu/OK** to confirm. Select a language by using the ▲ and ▼ keys then confirm by clicking on **Menu/Ok**, you may then go back to the main menu which is translated into the language you have chosen.

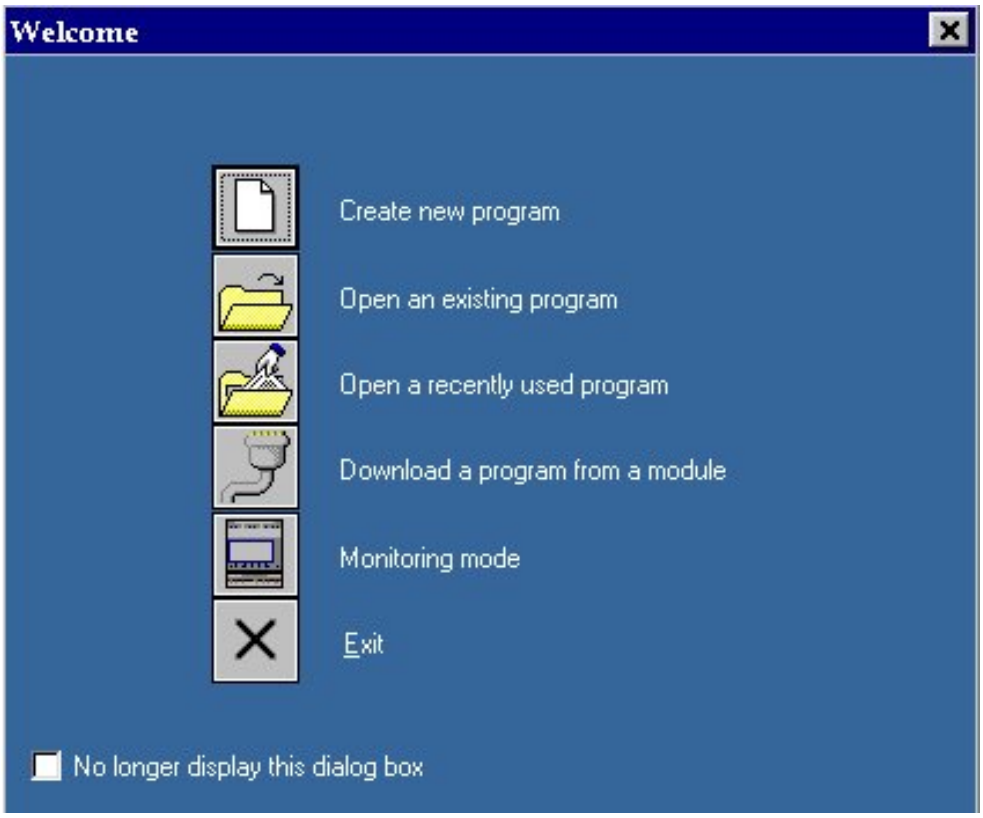
4 Using Zelio Soft

Note: The following descriptions are illustrated with functional examples.

Click on the  *icon to access the descriptions.*
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)****.*

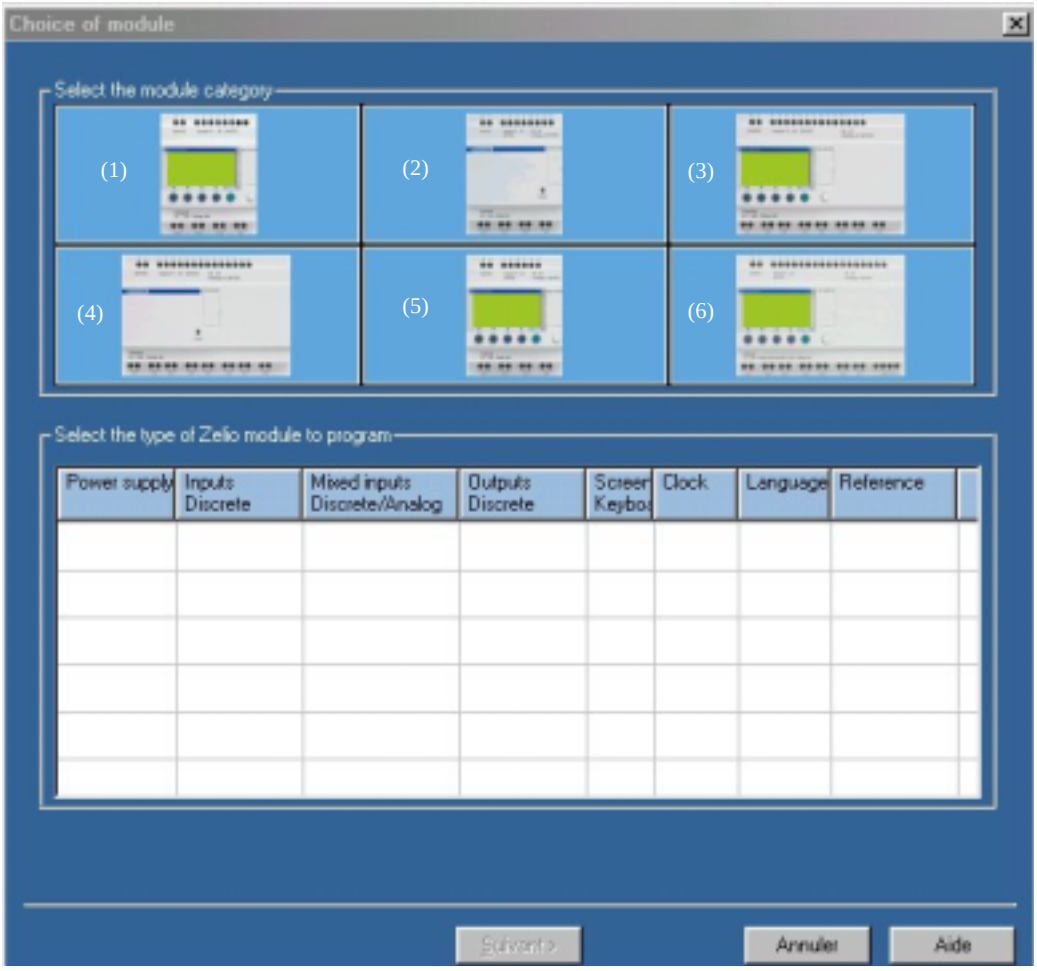
4.1 STARTING A PROGRAM

When the Zelio Soft program is launched, the following start-up window appears:



Click on **Create a new program** to start a program, or choose **New** in the **File** menu if the program has already been launched.

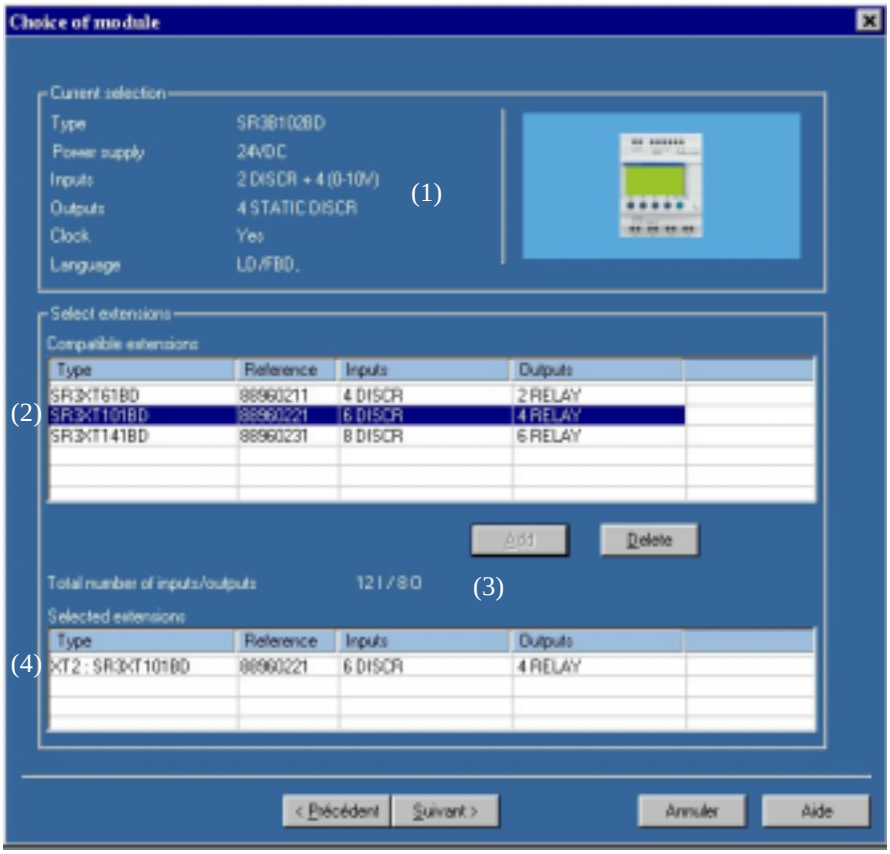
The smart relay option window now appears:



First select the desired module category :
(1) 10/12_I/O_WITHOUT_EXTENSION
(2) 10/12_I/O_WITHOUT_SCREEN_WITHOUT_EXTENSION
(3) 20_I/O_WITHOUT_EXTENSION
(4) 20_I/O_WITHOUT_SCREEN_WITHOUT_EXTENSION
(5) 10_I/O_WITH_EXTENSIONS
(6) 26_I/O_WITH_EXTENSIONS

Once you have selected the category (the category selected will appear in yellow), the corresponding module list appears below, click on the module type desired and click on **Next** or double-click directly on the module.

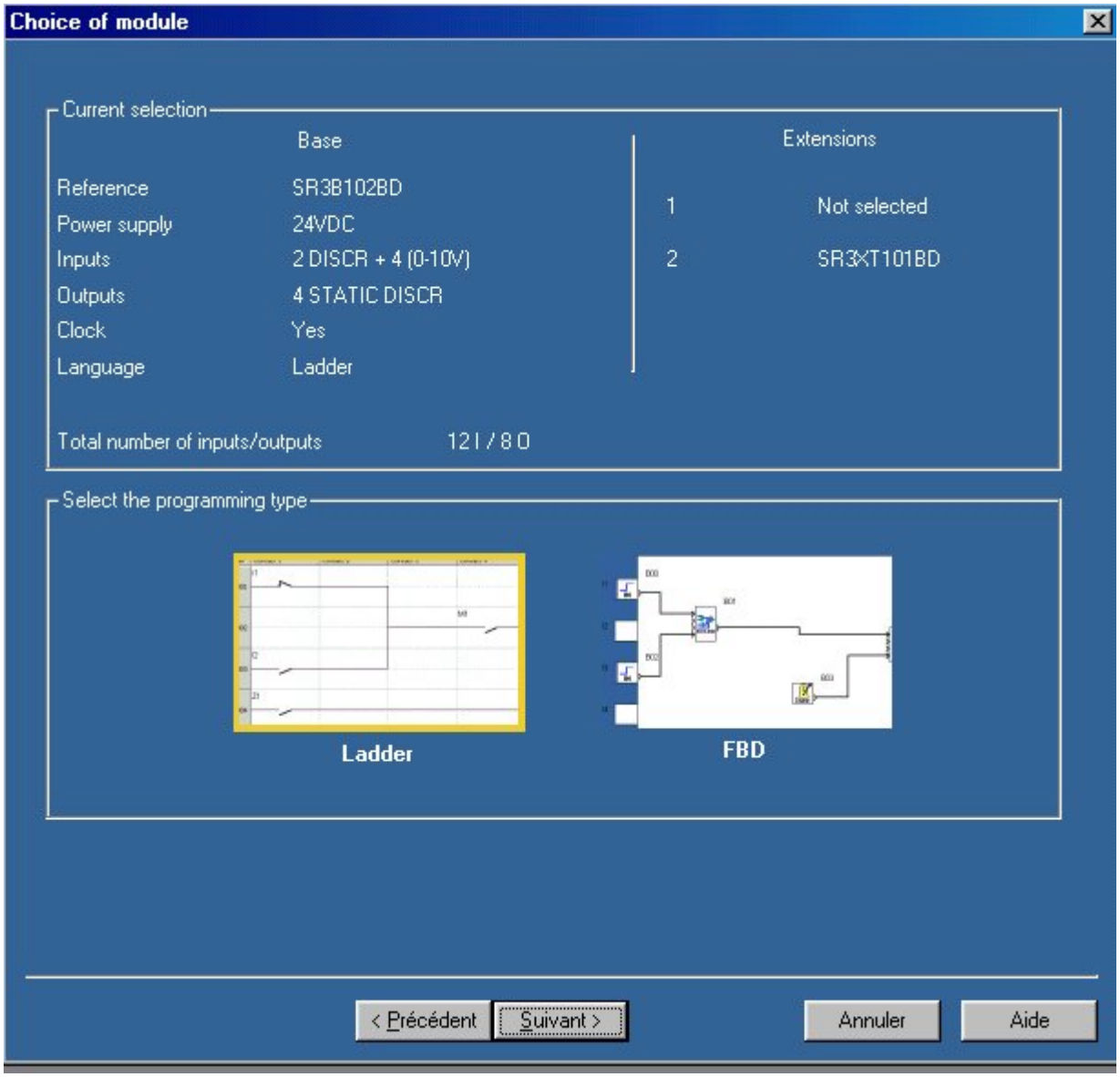
If you have chosen a module with extensions (line SR3), the following screen will appear (if you have chosen a non-extendable model, the programming type option screen will appear directly):



A summary of the charcacteristics of the module then appears in the upper left corner of the window **(1)**. You may go back to the module choice by clicking on **Previous.**
You may then add input/output extensions and/or a communication extension, available to you in list **(2)**. Just double click on the extension desired, and the total number of input/outputs is updated to line **(3)**. The selected extension is then visible at the bottom of window **(4)**.
For example, if the **SR3B102BD** module is selected, 3 types of extensions are available on the following screen: **SR3XT61BD**, **SR3XT101BD**, **SR3XT141BD**. You may select the **SR3XT101BD** extension by double-clicking on it, then deleting it by double-clicking on selection line **(4)** and replacing it with extension **SR3XT61BD**.

Note 1: The Zelio Logic extendable models only accept one I/O extension at a time and/or a Modbus communication extension.
Note 2: The basic modules and associated extensions must have an identical power supply.

Then click on **Next**. The programming type option screen appears:



A summary of the current selection (module chosen + possible extensions) appears at the top of the screen. You may choose your programming type in the lower box. If you wish to program in Ladder language, choose **Ladder**, and if you wish to program with functional block diagrams, choose **FBD.**

Note 1: The previous version of Zelio Logic only allowed for Ladder programming, you now have the choice between two complementary languages.
Note 2: Certain smart relay models are programmable only in Ladder language, here are their reference numbers: SR2 A101BD, SR2 A101FU, SR2 A201BD, SR2 A201FU, SR2 D101BD, SR2 D101FU, SR2 D201BD, SR2 D201FU (if you select one of these models, this screen will not appear).

The following 2 sections separately introduce and train you in the 2 types of programming.

4.2 LEARNING IN LADDER LANGUAGE
4.2.1 Getting started

4.2.1.1 The simplicity of Ladder language

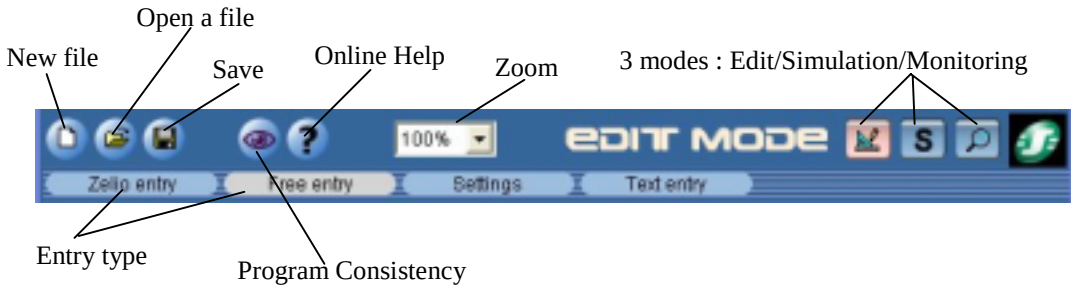
Zelio Logic is programmable in Ladder language. This type of programming allows you to carry out combinational logic functions. In this way, you may program your applications with Zelio Soft 2 or from its integrated programming screen and keyboard.

4.2.1.2 Accessing Zelio Soft help

There is help available in the menu bar of Zelio Soft 2 that you may access by clicking on menu **?** then on **Help**, or by clicking directly on the icon available in the tool bar.
To directly access Help concerning a function in use, click on **?** in the function's parameter window (which you may access by double-clicking on the function).

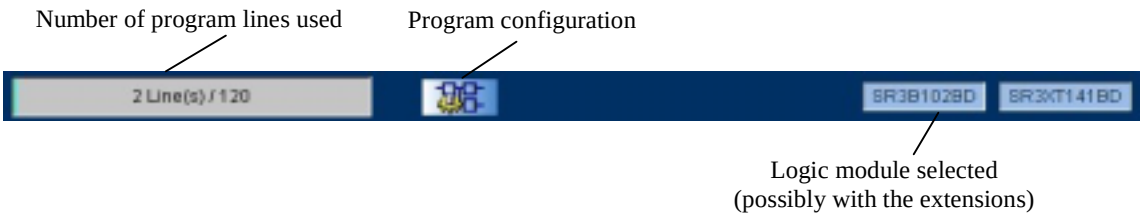
4.2.1.3 Toolbar

The toolbar contains shortcuts to menu options and offers a **Program coherence** function that is more highly developped. It also allows you to choose the **mode**: Editing, Simulating or Monitoring Lastly, it offers you 2 types of input mode: Zelio input mode (front panel of smart relay) and freestyle input mode (electric diagram or Ladder diagram).
Hover the mouse arrow over any button to see the action associated with it.



4.2.1.4 Number of lines used and the module chosen

A bar at the bottom of the screen indicates the chosen number of lines of the command diagram as well as the type of smart relay chosen by the program, and the possible extensions. This bar also contains the "Program configuration" icon which allows the different parameters linked to the application to be adjusted.



4.2.2 Writing a program in Ladder language

4.2.2.1 Modes and types of entering

When you have chosen your module and Ladder language, you are ready to build your application.
The selected Zelio Logic reference appears in the lower right **(1)**:

With the software program, you may choose to program in **Manual Data Entry** or in **Zelio Data Entry.**
The default is **Manual Data Entry:** A wiring sheet limiting the areas reserved for the contacts and for the coils (one only at the end of each line) appears on the screen.
Zelio data entry is identical to keyboard data entry in integrated programming. Therefore, the instructions for this type of data entry are the same as for the front panel programming.
To select this data entry, click on the corresponding tab **(1)**:

When you are in **Manual data entry**, you may visualize the this diagram in **Ladder symbols** or **Electric symbols** by selecting the desired symbol in the **View** menu.

This program has three modes: **Edition mode (1)**, **Simulation mode (2)** and **Monitoring mode (3)**. They may be selected in the **Mode** menu or from the toolbar in the upper right. The selected mode appears to the left of the 3 icons **(4)**:

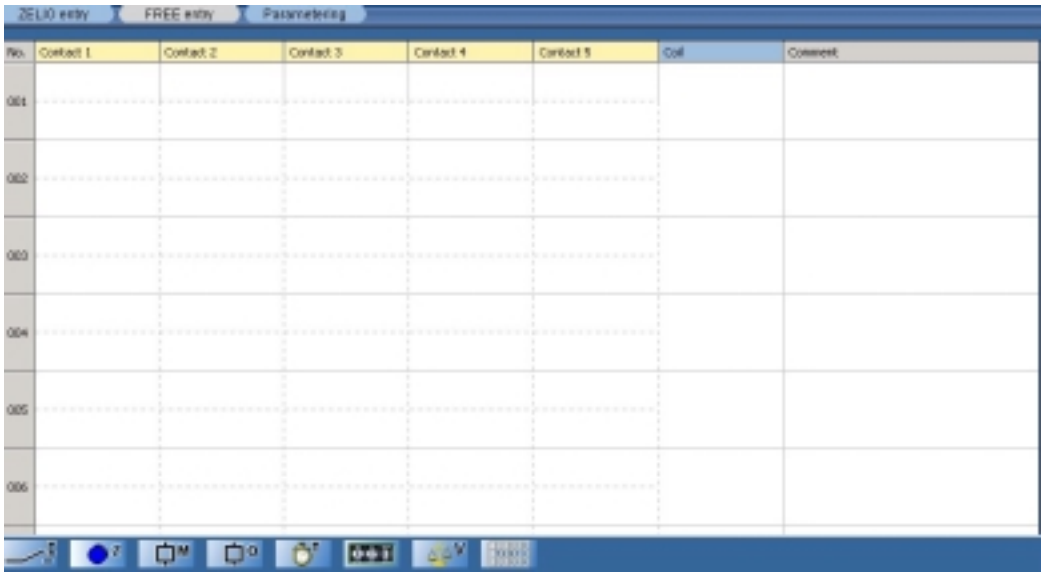
Edition mode is the mode in which you may edit the program and the supervision window. This is the default mode. **Simulation mode** allows you to simulate the program before transferring it to the module. **Monitoring mode** enables you to visualize the input and output statuses of the module in real time.

A **Supervision window** is available for Simulation mode and Monitoring mode. This window offers you the possibility of vizualizing the inputs/outputs that you have previously chosen and placed. This allows you to see the essential of the program to ensure an efficient tracking. Drawing functions enable you to illustrate the application.

4.2.2.2 Edit Mode: Programming the application

Entering a program on the wiring sheet

When you have selected your module type and Ladder language, a wiring sheet then appears:



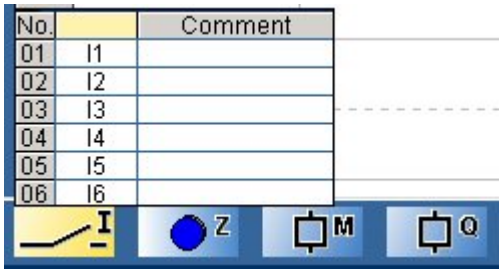
The default is **Edition mode Manual Data Entry:** The diagram is divided in columns, which allow you to distinguish the type of block to be placed. The first five columns are reserved for the contacts (yellow), the sixth allows you to place the output coil (blue). The last column is reserved for entering commentaries associated with each line. The dotted lines are lines where it is possible to wire in order to link functions with each other and to carry out the elementary logic functions **ET** and **OU**

To create a block on the sheet, choose the block type by pointing to the corresponding icon at the bottom of the sheet:

(1) Discrete Input I
(2) Front panel button
(3) Auxiliary relay M
(4) Output Q
(5) Timer
(6) Counter

(7) Counter comparator
(8) Analog comparator
(9) Weekly clock
(10) Display
(11) Backlighting
(12) Daylight Savings Summer/Winter

The list of available elements is displayed when you point to each icon:

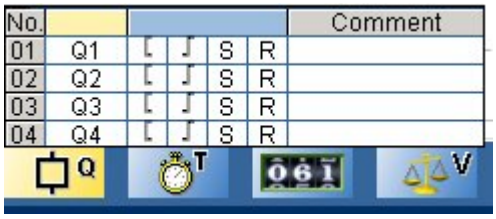


The comment cell allows you to associate a name with each element (double click on the zone)

Click and drag the blocks to put them into place on the wiring sheet. The ⊘ symbol appears when it is impossible to place the block in a given zone.

For example, if you have just clicked and dragged **12** to place it on the wiring sheet, the ⊘ symbol will appear when you try to place it as a coil, indicating that it may only be placed as a contact (also indicated by a color code)

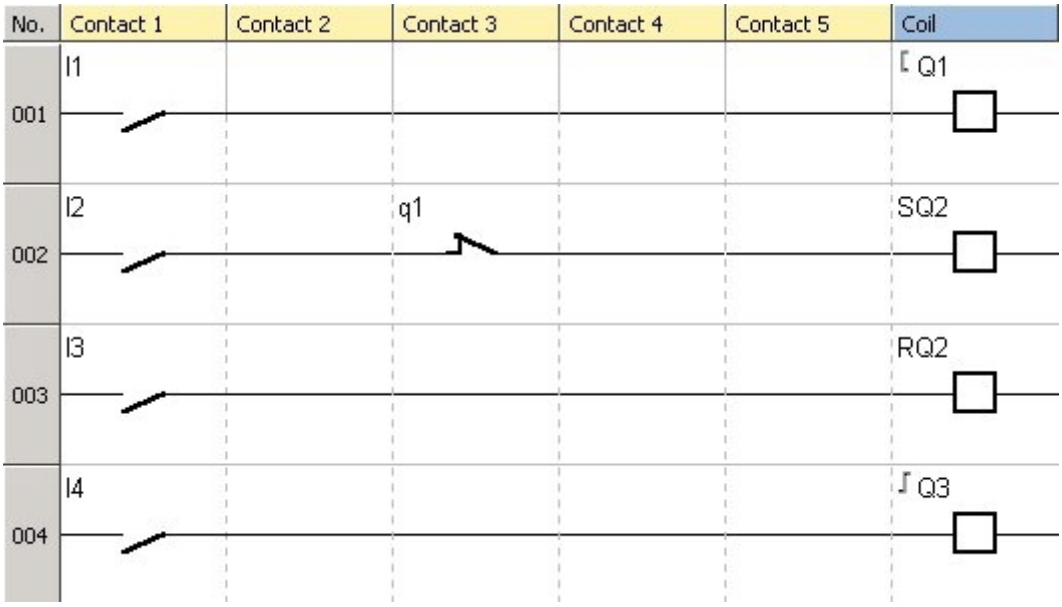
Continue placing the other blocks in the same manner. To wire the reciprocal function (for example **i1** for the reciprocal input **I1**), either select the block by clicking on it (yellow background will appear) and press the space bar, or right click on the mouse and select the reciprocal function. Connections are made by clicking on the dotted line cells that you wish to wire.
The charts corresponding to functions containing different types of inputs/outputs appear as follows:



The different input/output-type possibilities appear in the chart. When one of them has been placed and it can be used only once (example: coil reset **RQ2)**, the corresponding cell is grayed in and it is impossible to use it again.

Note: On the wiring sheet, it is possible to review the different types of output coils by clicking on the box (yellow background will appear when selected) and pressing the space bar.

For example:



In this example; the 3 types of coils are used: Contactor **[**, Set/Reset **S**/**R** and Auto Relay ⌠.
Q1 recopies input **I1** status. As for **Q2**, it cannot be activated unless **12** changes to high status while the **Q1** coil is at rest (**q1** reciprocal function of **Q1**). **P**ress **I3 to** deactivate **.** Finally, **I4** controls impulse relay coil **Q3**.

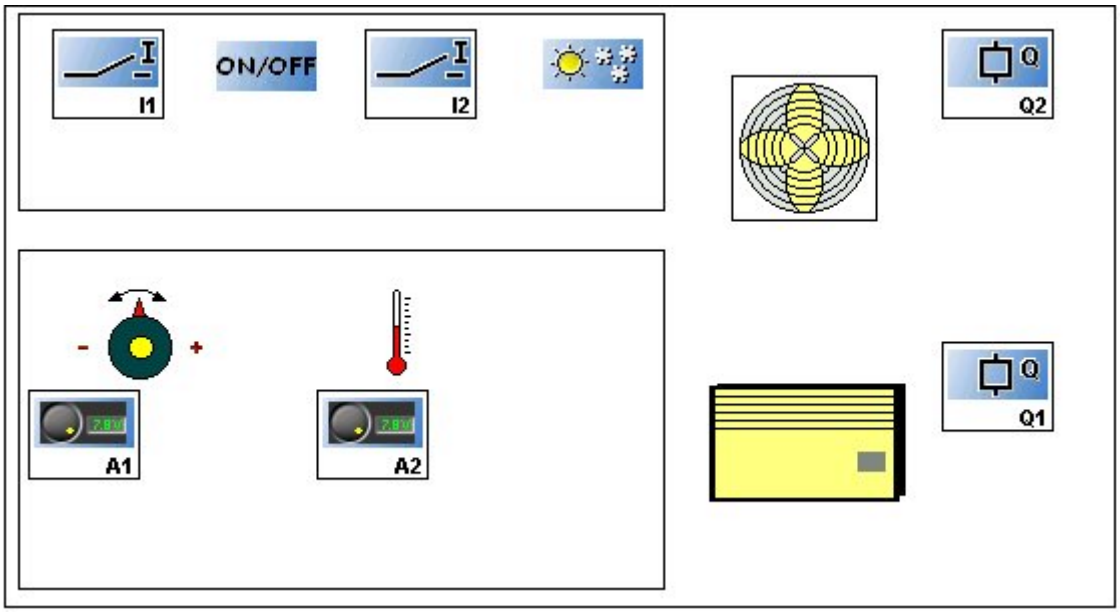
Click on the link below to access the example:
(Ex 01)

To set parameters for a function (for example a timer), double click on one of the inputs/outputs for this function. A configuration window will then appear. You may choose the following parameters. For further details on each function, refer to **4.2.3 Functions**.

Supervision Window

Select **Window** then **Supervision.** Simply click and drag the inputs/outputs and block function that you have chosen from the wiring sheet to the supervision window. You may illustrate your application using the tools in the **Drawing** menu. You may also choose a background image in Bmp format. This window clearly displays the elements you placed in the wiring sheet in their environment. When you change to simulation or monitoring mode, the inputs and outputs are updated and it is also possible to force an input, as with the wiring sheet.

The following is an example of window supervision using Ladder programming:



The inputs/outputs are located the application as follows.

This example concerns temperature control in a room. Regulation may be disabled by the **I1** switch and the hot or cold mode is activated by the **I2** switch (in cold mode, only the fan is activated). The setpoint is compared to the room temperature and if the difference is greater than a given value (Comparators **A1** and **A2**), the fan and possibly the heating are activated (**Q1** and **Q2**).

Note: This application is developed in the application library in Ladder language under the name "Room temperature regulation".

Click on the link below to access the example:
(Ex 02)

Programming in Zelio entry mode or in manual entry mode with the integrated keyboard

For information on programming in Zelio entry mode, please refer to the operating manual. The software program allows you to use the keyboard shortcuts to simplify programming, such as the Shift key for **Shift** (White key) or Enter for **Menu/Ok.**

Coherence Function

The coherence function, represented by the eye icon in the status bar, indicates any coherence problem in the wiring. It also allows wiring verification and correction if necessary.
A blue icon indicates the wiring is correct. A red icon indicates an error. Click on the red icon to see the different wiring errors.

Blue Icon: NTR

Red Icon: Wiring problem, click on the icon to find out more

Program configuration

Program configuration allows you to customize your file by adding the project name and author. It is also possible to adjust certain configuration settings and to choose the date format.
Click on the corresponding icon  in the lower bar to access program configuration.

4.2.3 Functions

Note: The following descriptions are illustrated with functional examples.

Click on the  *icon to access the descriptions.*

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

For further details on a function described below, refer to Help: Double-click on the block and then on **?**

4.2.3.1 Discrete Inputs

Discrete Inputs I

Discrete-type inputs (**I1**,**I2**,…) and mixed inputs (discrete or analog) (**IB**, **IC**…) In Ladder programming, a mixed input placed on a contact is always discrete. The analog comparator function allows the mixed input to be used as an analog ouput. All analog inputs take 0 to 10 V input voltage, corresponding to a value of 0 to 255.

Buttons

You may use 4 Zelio Logic front-panel buttons (**Z1**, **Z2**, **Z3**, **Z4**) in your application. Unlike the physical inputs I, they do not have connection terminals.

*Note 1: **Zx** keys can not be used if locked (see APPLICATION TRANSFER for further details).*

*Note 2: When the module is running and you wish to use the **Zx** keys in the program, access the INPUTS-OUTPUTS screen and simultaneously press **Shift** (White key) and **Z1**, **Z2**, **Z3** or **Z4**.*

4.2.3.2 Outputs

Q Outputs

Discrete-type outputs can be used either as coils or contacts.

- Use as coil:

[Q (Contactor): The coil is energized if the contacts to which it is connected are closed.

⌡**Q (Impulse relay):** Impulse energizing, the coil is energized by a change of state. Its function is identical to that of an impulse relay.

SQ (Set) : "Set" (latch) or triggered coil. This coil is triggered as soon as the contacts that are connected to it are closed. It remains triggered even if the contacts are no longer closed.

RQ (Reset) : "Reset" or (unlatch) or deactivated coil. This coil is deactivated as soon as the contacts that are connected to it are closed. It remains inactive even if the contacts are no longer closed.

- Used as contact:

Q (Normal function) or **q** (Reciprocal function): physical output from the smart relay. An output can be used as a contact to determine its state at a given time.

Example 1:
Q1--------[Q2
Q2 duplicates input **Q1** status.

Example 2:
q1--------[Q2
Q2 output will always be reciprocal to **Q1** status.

*Note: The **[** and ⌡, **SET** and **RESET** functions must be used once and once only for each coil in a control diagram.*

*Additionally, if you use a **SET** (**S** function), a control diagram line must always be provided for disabling this coil using a **RESET** (**R** function).*

If this is not done, there will be always the risk of generating unexpected switch statuses during operation.

Auxiliary M Relays (or internal memory)

The auxiliary relays operate just like the **Q** output coils. The only difference is that they do not have any connection terminals. They are used to save or forward a state. The saved or forwarded state will then be used as the assigned contact.

For example:

I1----------[M1
M1--------[Q1

Activation of input **I1** activates **Q1** output, via **M1**.

4.2.3.3 Block Functions

Boolean Function

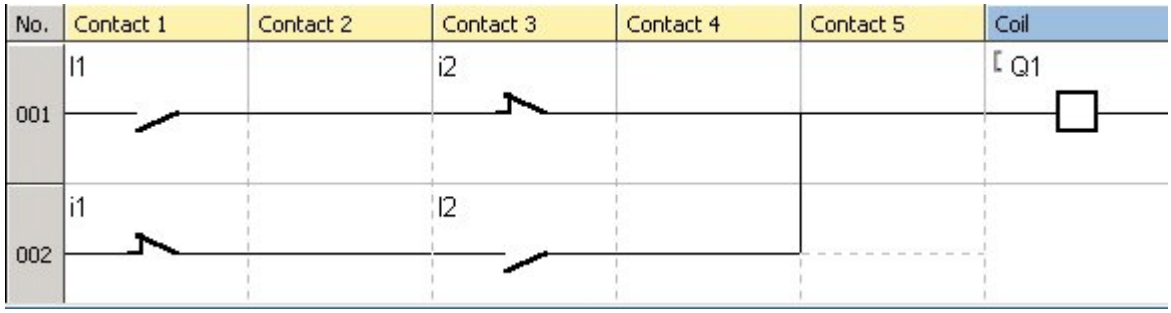
The control diagram entry mode allows you carry out Boolean functions by using the elementary logic functions **AND** and **OR**:

I1—I2———Q1 *Associated logic equation:* **Q1=I1xI2, AND** Logic

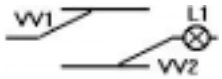
I1—I2———Q1 Associated logic equation: **Q1=I1+I2, OR** logic
I2—|

Function **i,** the opposite of **I**, produces **NO.** This makes it possible to produce many different functions.

Example of a Boolean function:



The following logic equation: **Q1=(I1 x I2\)+(I1\ x I2)=(I1 X i2)+(i1 x I2)**
Corresponds to the following electrical diagram:

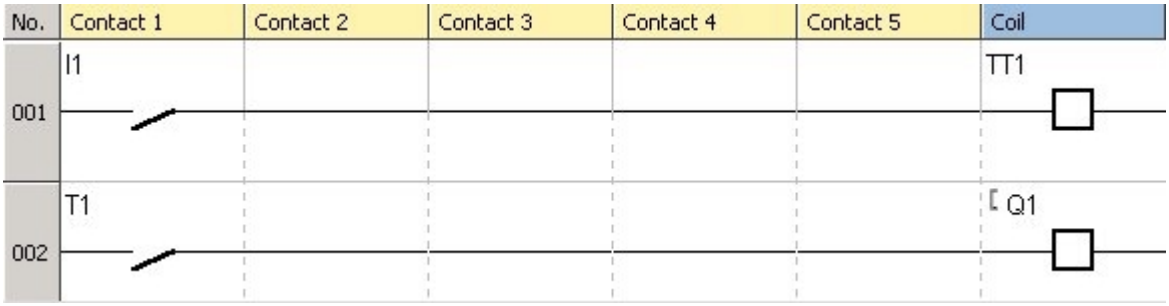


This example illustrates the implementation of a two-way switch.

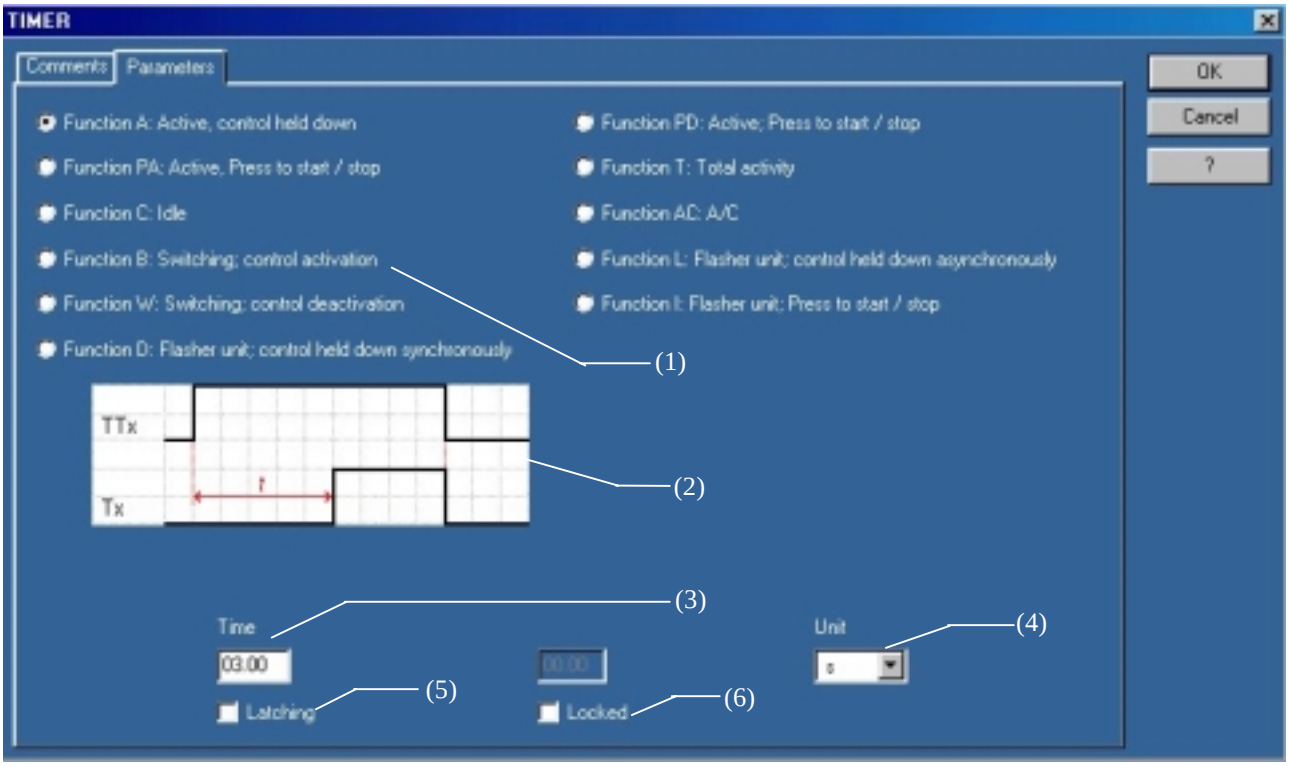
Timer T

The Timer function block is used to delay, prolong and control actions during a set period of time.

Example of a diagram using this function:



Double click on **TT1** or **T1** to display the T1 timer block parameter setting window:



A list of functions **(1)** allows you to choose the type of timer. A diagram **(2)** corresponding to each timer type enables you to find the function you need to use. Zone **(3)** enables you to enter the time lag required for each unit **(4)**. Latching is activated by checking the relatching box **(5).** You may lock the parameters by checking this box **(6)**.

Explanation: When **I1** is in high status, **Q1** will change to high status with a time lag t (here 03.00 s) and it will go back to the low status when **I1** is deactivated (**A type** function)

Click on the link below to access the example:
(Ex 03)

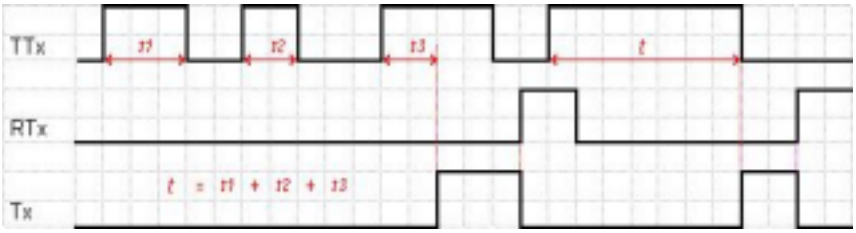
There are 3 main types of timers:

- *Type A: Active, Control Held Down*

For example: Delay the second motor start-up to limit energy consumption.

Click on the link below to access the example:
(Ex 03)

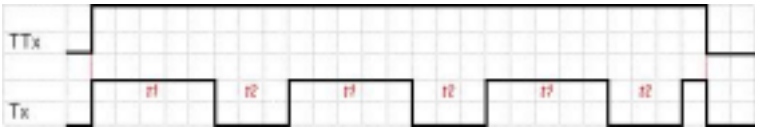
- *Type T: Total Activity Accumulator*



For example: Request replacement of equipment when recommended service life is exceeded.

Click on the link below to access the example:
(Ex 04)

- *Type L or Li:* Flasher Unit, Control Held Down/Asymmetrical



For example: Control a sound signal and create an alarm sound.

Click on the link below to access the example:
(Ex 05)

Other types of timers may be used (11 types of timers)
Each timer type possesses an input control (**TT**) and an input reset (**RT**).

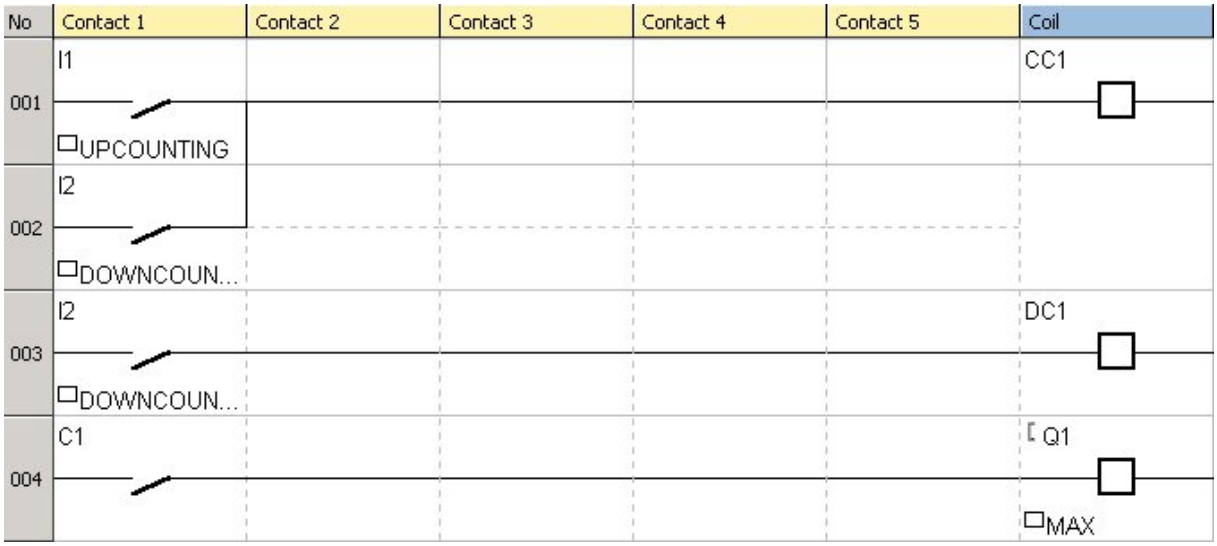
"LATCHING" Save data function available.

Counter

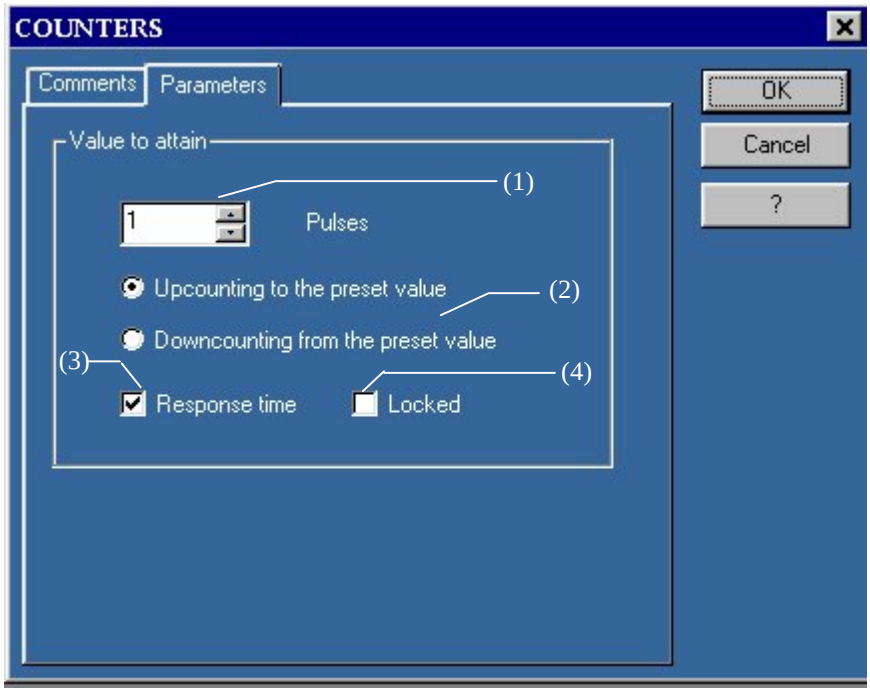
This function enables you to upcount or downcount pulses, until a value preset in the parameter setting window has been reached.

The block function Counter contains a count input (**CC**) (each time the coil is energized, the counter is incremented or decremented by 1 depending on the chosen counter direction), a Reset input (**RC**), a counter direction input (**DC**) (the block downcounts if this input is activated) and a **C** output that enables you to know what level is controlled by the counter. When the preset value has been reached, this output goes to 1 until it is zeroed or the counting direction changes. The counting value and the preset value can be visualized on the module screen.

Diagram produced using this function:



The parameter window is as follows:



Field **(1)** enables you to enter the value to be reached (preset value). In **(2)**, you may choose between counting up to the preset value or counting down from the preset value. Latching is activated by checking the latching box **(3).** Check box **(4)** to lock the parameters**.**

Explanation: Every time **I1** is pressed, the counter is incremented by 1. Pressing on **12** changes the counter direction (**DC1**), the counter counts down. When the preset value is reached (here 5), **C1** will be in high status, as will **Q1** output.
In a parking lot for example, each car input activates **I1** and each output activates **12.** When the parking lot is full, the **Q1** output blocks the input.

Click on the link below to access the example:
(Ex 06)

"LATCHING" Save data function available.

Fast Counter

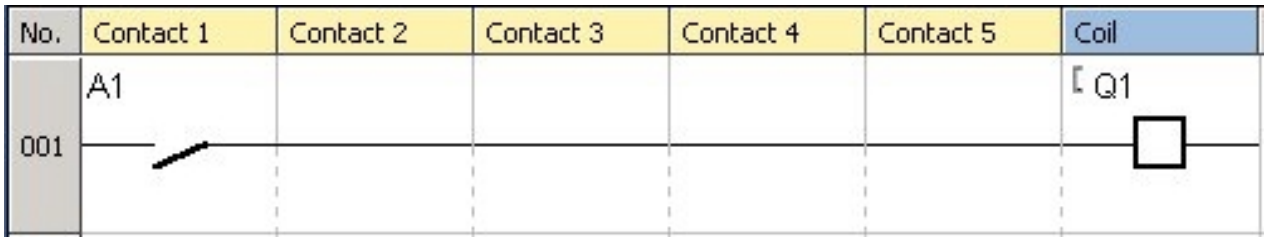
Counter Comparator

Analog Comparator

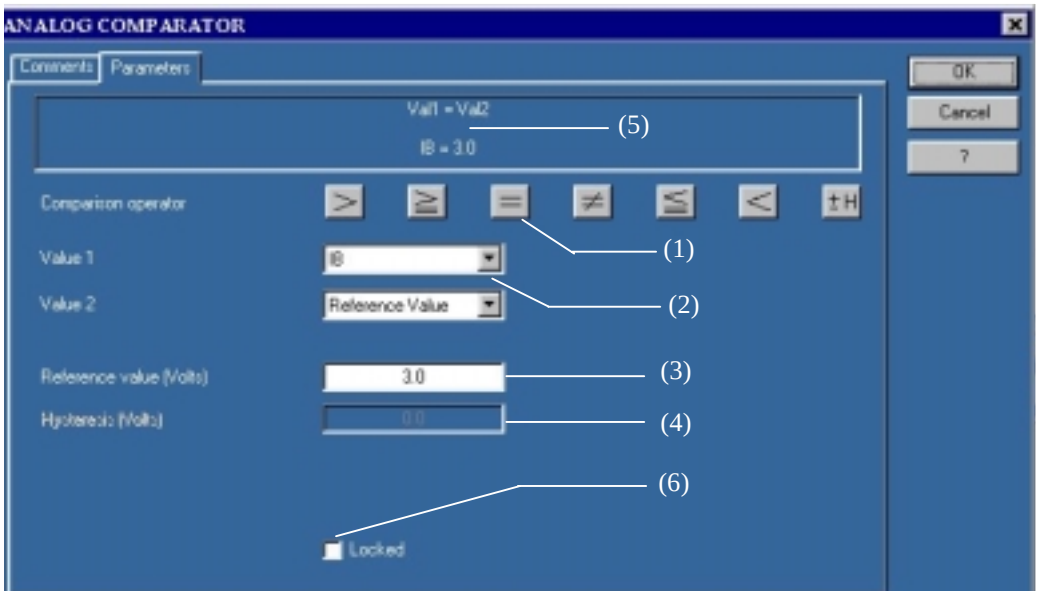
Available only in modules with analog outputs.

This function block is used in applications using analog data, and enables you to compare a measured analog value and an internal value, or two measured analog values.
The comparison result is used as a contact.
This function is shown in the diagrams by the letter **A** (**a** for the reciprocal function).

Diagram produced using this function:



Parameters for the **A1** block are shown as follows (double click on **A1**):



Different comparison operators may be used **(1)**. Use fields **(2)** to select the 2 values to be compared. The values in use are the analog inputs (up to 6 according to the model) and the reference value entered in field **(3)** (between 0.0 and 9.9 V). Field **(4)** does not appear until you select the operator "+-H"; this field will then enable you to enter the hysteresis value. Frame **(5)** summarizes the operation carried out according to the operators and operands chosen. Cell **(6)** can be used to lock the parameters.

Explanation: Contact **A1** is closed when the value of analog input **IB** equals or exceeds the value of **IC**. Output **Q1** is now active.
For example, in a room, when the temperature (analog input **IB**) exceeds the **IC** setpoint, the **Q1** fan will start up.

Click on the link below to access the example:
(Ex 07)

Here are 2 examples of formulas and their interpretation:

- Value 1 = Value 2

with Value 1=ID and Value 2=Reference Value=5.6V

Contact **A1** is closed when the value of analog input **ID** equals or exceeds the reference voltage entered. In this case, 5.6 V.

Click on the link below to access the example:
(Ex 08)

- Value 1 – H <= Value 2 <= Value 1 + H

with Value 1=ID and Value 2=IC and Hysteresis (H)=2.3 V

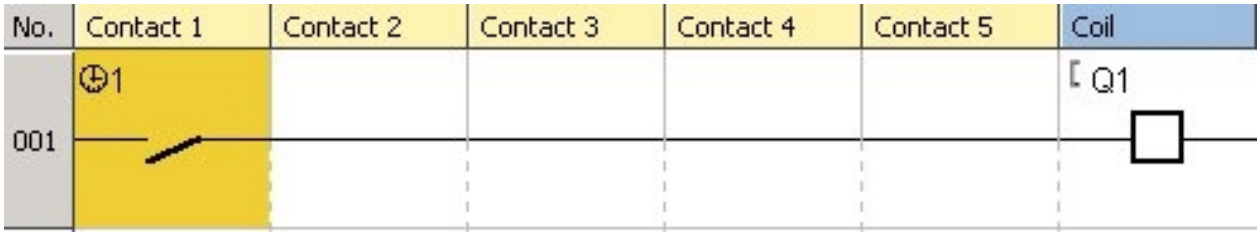
Contact **A1** is closed when the value of analog input **IC** is between **ID - 2.3 V** and **ID + 2.3 V**.

Click on the link below to access the example:
(Ex 09)

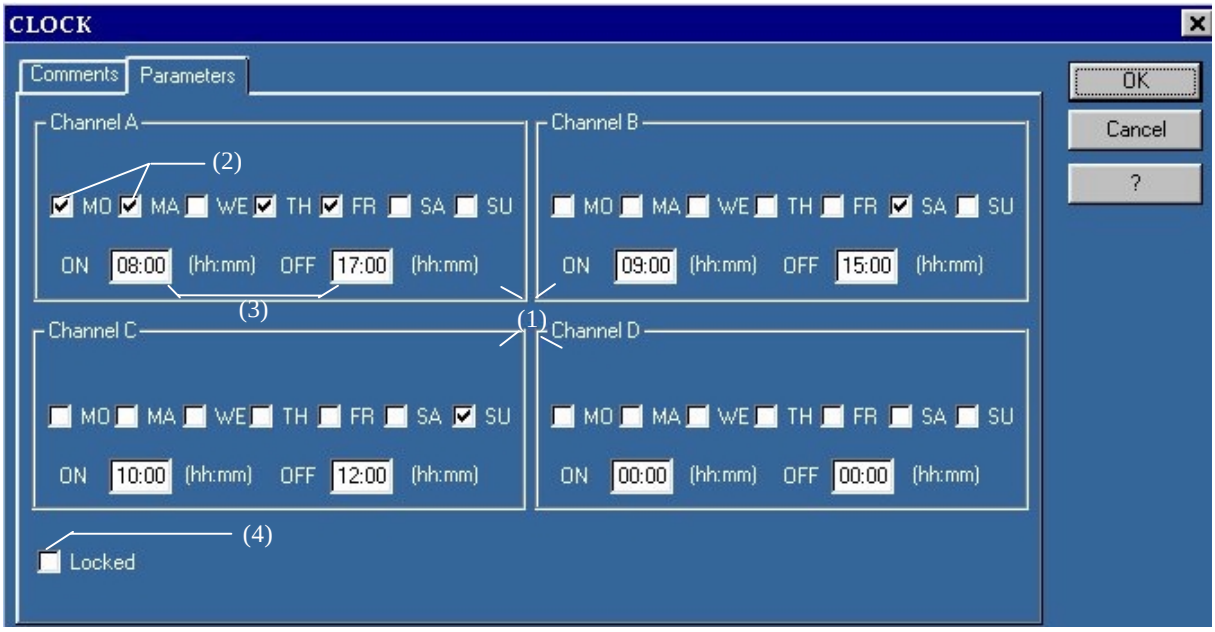
Clock Block Function - Daily and weekly programmer

Available only in modules with a clock.
This function is used to activate or deactivate the output at a specific moment during the day or the week. This function is therefore only placed on a contact. This block is event based.

This function is shown in the diagrams by the symbol (for the reciprocal function).
Diagram produced using this function:



The parameters of the **1** block appear as follows:



Four separate time slots are available **(1)**. Fields **(2)** enable you to choose the days of the week when the clock will be activated. The activation and deactivation schedule must be entered in the "ON" and "OFF" fields **(3)**. Cell **(4)** may be used to lock the parameters.

Explanation: The **Q1** coil will be activated every week from Monday to Friday from 8 a.m. to 5 p.m. (Channel A), Saturday from 9 a.m. to 3 p.m. (Channel B) and Sunday from 10

a.m. to 12 p.m. (Channel C). Channel D was not used in this example. This clock could be used, for example, to define the hours during which a building is open.

Click on the link below to access the example:
(Ex 10)

Display function

Available only in modules with a display system.

Display screen backlighting.

Available only in modules with backlighting.

When activated, the function acts as an output and ensures display lighting.

Daylight Savings Change Summer/Winter

Available only in modules with a clock

The output for this function is OFF when winter daylight saving time applies, and ON when summer time applies. The switch from winter to summer time is displayed on the screen.

4.3 LEARNING TO USE FBD (FUNCTIONAL BLOCK DIAGRAM) LANGUAGE
4.3.1 Getting started

4.3.1.1 FBD: A language offering multiple possibilities

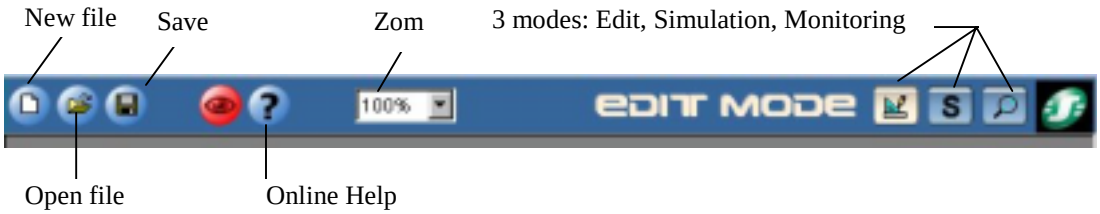
Zelio Logic may be programmed in FBD (Function Block Diagram) language, a graphic language offering multiple possibilities. With Zelio Logic, you may also add SFC-Grafcet functions to your application.

4.3.1.2 Accessing Help

In Zelio Soft 2, you may access Help from the menu bar by clicking on the **?** menu, then on **Help**, or by clicking directly on the  icon available in the tool bar.
To directly access Help for a function in use, click on **?** in the function parameter window (access by double-clicking on the corresponding block).

4.3.1.3 Toolbar

The toolbar contains shortcuts to menu elements. It also allows you to choose the **mode**: Editing, Simulation or Monitoring. Hover the mouse arrow over any button to see the action associated with the button.



4.3.2 Entering a program in FBD

4.3.2.1 Modes

Once you have selected the appropriate module and the FBD language, you are ready to program your application.
The reference for the Zelio Logic version selected will appear in the lower right corner **(1)**:

The software provides a choice of three modes: **Edit mode (1)**, **Simulation mode (2)** and **Monitoring mode (3)** (Supervision). You may select the modes in the **Mode** menu or with the toolbar in the upper right. The selected mode appears to the left of the 3 icons **(4)**:

Edit mode allows you to edit the program and the supervision window. This is the default mode. **Simulation mode** allows you to simulate the program before transferring it to the module. **Monitoring mode** enables you to visualize the input and output statuses of the module in real time.

A **Supervision window** is available in simulation and supervision mode. This window allows you to visualize the inputs/outputs that you have previously chosen and placed. This allows you to have a permanent overview of the application to ensure efficient monitoring. Drawing functions can be used to illustrate the application.

4.3.2.2 Edit Mode: programming the application

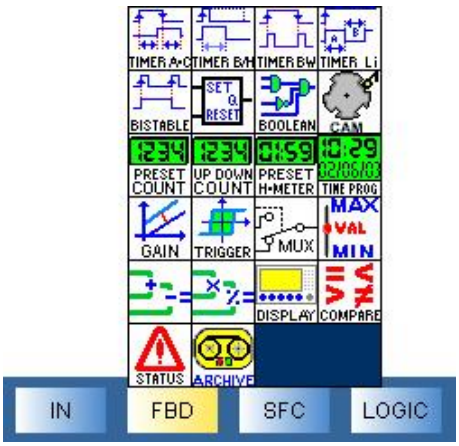
Entering a program on the wiring sheet.

When you have selected your type of module and the FBD, a wiring sheet then appears:

The default is **Edit mode:** The sheet shows the module inputs **(1)**, the module outputs **(3)** and one zone which is reserved for block programming **(2)**.
Point to the appropriate icon at the bottom of the sheet to create a block on the sheet:

(1) Inputs
(2) FBD Functions
(3) Grafcet/SFC functions
(4) Logic Functions
(5) Outputs

You may see the list of available elements by placing the mouse pointer over one of these icons:



Click and drag the blocks to put them into place on the wiring sheet. The ⃠ symbol appears when it is impossible to place the block into a given zone.

After having placed the various blocks, you can interconnect them : click and drag from the output **>** of the first block to the input **>** of the second block then release the mouse button. To build your application :

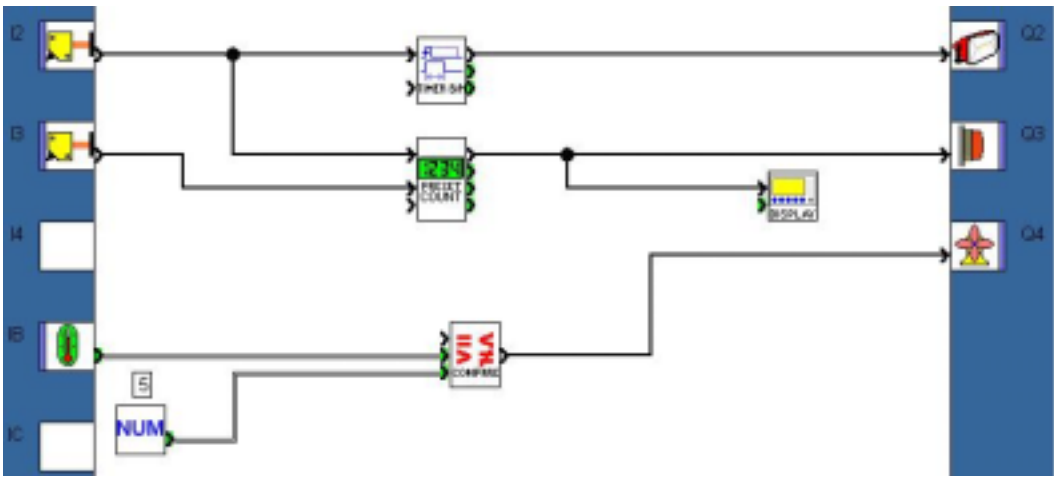
Select the input blocks and place them on the input lug, select the output blocks and place them on the output lugs. Then select the function blocks, and wire the different points. Double click on the functions to configure them.

It is possible to change the input or output type. This option does not change anything from an operating point of view.

If you want to change an input or output type, just double click on the icon and choose an alias.

You can add a commentary and drawings on the wiring sheet. To do so use the **Draw** menu.

For example: If you want to control car park entrances/exits. Each entrance **I1** activates the light for 1 minute (output **Q2**) and increments the counter. Each exit decrements it. When the car park is full (25 cars) an indicator lamp lights (output **Q3**) and the module displays ‘’CAR PARK FULL’’ ». In addition, when the temperature exceeds a threshold, a fan starts up (output **Q4**)



Click on the link below to access the example:
(Ex 11)

Supervision Window

Select **Window** then **Supervision.** Simply click and drag the inputs/outputs and block function that you have chosen from the wiring sheet to the supervision window. You may illustrate your application using the tools in the **Drawing** menu. You may also choose a background image in Bmp format. This window clearly displays the elements you placed in the wiring sheet in their environment. When you go into simulation or monitoring mode, the inputs and outputs are updated. It is also possible to force an input in the same way as in the edit window.

Program configuration

The program configuration allows you to customize your file by giving the project name and author, and it is also possible to adjust certain configurations and choose the date format.
Click on the corresponding icon in the lower bar to access the program configuration.

4.3.3 Functions

Note: The following descriptions are illustrated with functional examples.

Click on the  *icon to access the descriptions.*
If Zelio Soft 2 software is installed, click on the link to open the program. You may then select simulation mode ***(1)*** *and start the module (**RUN**)* ***(2)****.*

For further details on a function described below, refer to Help: Double-click on the block and then on **?**

4.3.3.1 Inputs

TOR. Discrete Inputs

The application can be customized by selecting another icon to show a presence detector or a backlit pushbutton for example.
To change icons, place a Discrete block on the wiring sheet, then double click on it. Different types of Discrete inputs are then offered.

Analog inputs

This type of input accepts an incoming voltage of 0 to 10 V corresponding to a value of 0 to 255.
The application can be customized by selecting another icon to show a temperature sensor or a potentiometer for example.

Filtered inputs

Filtered digital or analog inputs can be inserted in the wiring. These types of inputs can be used to eliminate parasites.

Integer input (NUM IN)

Constants

Constants can be inserted in the wiring.
There are analog constants and digital constants.

1 sec clock

A 1 second clock can be wired at the input.

Summer/winter time change

The output for this function is OFF when winter daylight saving time applies, and ON when summer time applies. The switch from winter to summer time is displayed on the screen.

Buttons

The 4 buttons of the front panel of the Zelio, **Z1**, **Z2**, **Z3**, **Z4** can be used in your application.

Input examples

Click on the link below to access the example:
(Ex 12)

4.3.3.2 Outputs

Discrete output

The application may be customized by selecting another icon to show, for example, a fan or heating resistor.
To change icons, place a Discrete block on the wiring sheet, then double click on it. Differents types of Discrete outputs are then offered

Integer Output (NUM OUT)

Backlight output

This output is used to drive the backlighting of the module screen.

Examples of outputs

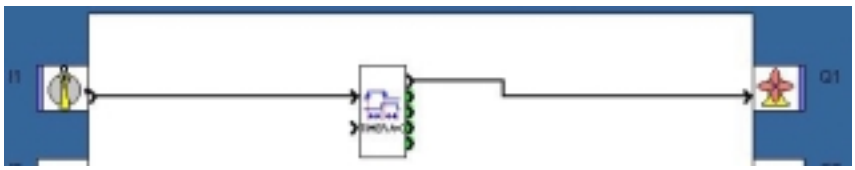
Click on the link below to access the example:
(Ex 13)

4.3.3.3 FBD (Function Block Diagram) Function blocks

Note: Simply double click on the block to access the corresponding function configuration.

A/C Timer

It is used to delay passage to ON or to OFF, or both, with respect to the input signal by applying this delay to the output signal. This block can be used to set a timer for function A or function C.
The A/C Timer is connected as follows:



For example: to avoid overconsumption on boiler start-up, the heating elements are heated progressively. The first heating element is started up, followed by the second element 5 seconds later (or 50x100 ms), and likewise when the boiler is turned off.
Click on the link below to access the example:
(Ex 14)

"LATCHING" Save data function available.

B/H Timer

It is used to set the output signal to high status for a selected amount of time. It is triggered by a input pulse (B function) or when the input is in high status (function H).

For example: A stairway timer. When the button is pressed, the light stays lit for 2 minutes. (function B).
Click on the link below to access the example:
(Ex 15)

"LATCHING" Save data function available.

BW Timer

It supplies a pulse lasting one cycle on the leading or trailing edge or both edges of an input according to the setting selected in the parameters.

Blinker

It is used to generate pulses on the leading edge of the input.

"LATCHING" Save data function available.

Bistable

The principle of this block is the well-known trip-switch mechanism. An initial pulse suffices to set the output to 1 and a second pulse sets it to 0.

Flip-flop

This is an element composed of two inputs: **R** and **S**. R for Reset and S for Set. To activate the output, the generation of a pulse on S suffices, to deactivate it a pulse must be generated on R. The priority is used to define the status of the output when both inputs are set to 1.

Boolean Function

It accepts four inputs. The output reacts according to the truth table described in

the parameters.
Double-click on the block, or right click and select the configuration window, to access the parameters of the Boolean function .

For example: Execution of the Boolean equation **Q1= (I1+I2) x (I3+I4) = (I1 or I2) and (I3 or I4)**

Click on the link below to access the example:
(Ex 16)

Camshaft

This function is used to create a cam programmer

''LATCHING'' Save data function available.

Counter

This function is used to count to a value specified in the configuration window. When this value is reached, the output goes to 1 until reset if the fixed output is selected or for a certain amount of time if the pulse output is selected. The counting value and the maximum value can be visualized. It is possible to count from zero to the specified value (count up) or from the specified value to zero (count down)

The COUNT UP DOWN block is used to set the pre-selection value at the input, while it can be programmed for the PRESET COUNT block.

For example: A machine produces parts. One part is produced per second. This is shown by a blinking function Li (OnT=1s, OffT=0.1s). The counter is incremented by 1 each time a part is produced. The machine stops when the number of pieces produced reaches 5, and an operator packages them. The operator presses the button again to reset the counter and start production up again.
Click on the link below to access the example:

(Ex 17)

"LATCHING" Save data function available.

Time counter

This function measures the length of the input's 1 status. Past a pre-selected time, the output changes status. For example, this block can be used as a maintenance alert on a machine.

"LATCHING" Save data function available.

Weekly and yearly programmer

This function is used to activate or deactivate the output at a given time during the day, week or year. This block is event-based. To create an event, go the **Parameters** tab, and click on **New** to create a cycle. Choose the time when this event occurs, then specify the status of the output for that instant. The event frequency can be selected. Use the calendar to the right of the screen.

The **Summary** tab gives the description of the programmed events.

The gain function

This function allows the use of a scale factor, it is applicable to all analog data.

Schmitt trigger

The output changes status if the input is less than the minimum value. The output changes status again if the input is greater than the maximum value. If the input is in between both values, the output remains unchanged.

This function is used to situate a high threshold and a low threshold with respect to an analog variable.

For example: To control room temperature, the heater is set to come on when the temperature is 3°C below the setpoint and to turn off when the temperature goes 2°C over the setpoint. A Schmitt trigger is used with room temperature, maximum setpoint (setpoint + 2°C) and minimum setpoint (setpoint - 3°C) as input.
Click on the link below to access the example:

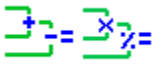
(Ex 18)

Multiplexer function

This function is used to select channel A or channel B as output.

Zone comparison

Used for applications using analog data.



+ - x / operations

The combination of these two blocks enables you to perform many operations with numerical constants.

LCD Display

This block is used to display text or an integer on the LCD on the front panel of the module. For example, a decimal can be displayed from an integer.

For example: We want to display the number of vehicles present in an underground car park. If the maximum is reached (10 in this case), a message diplsays ‘’Car park full’’.

Click on the link below to access the example:
(Ex 19)

*Note: After switching to Simulation mode and starting up the module, select **3 Front Panel** in the **Window** menu to display the module screen. On the module screen, select **FBD display** by clicking once on the **DOWN button** then on **Menu/Ok**. The messages then appear on the screen.*

Comparison of two values

This block is used to compare two analog values using the operators =, >, >=, <, <=, !=. The output is the Discrete type and it is activated if the comparison is true.

Module status function

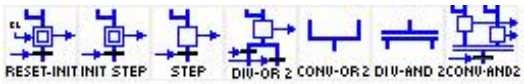
This function enables us to see the status of the module.

Archiving function

Providing several items of information at output, including the date and time, this function is used to display and modify information on the screen.

"LATCHING" Save data function available.

4.3.3.4 Grafcet / SFC (Sequential Function Chart)

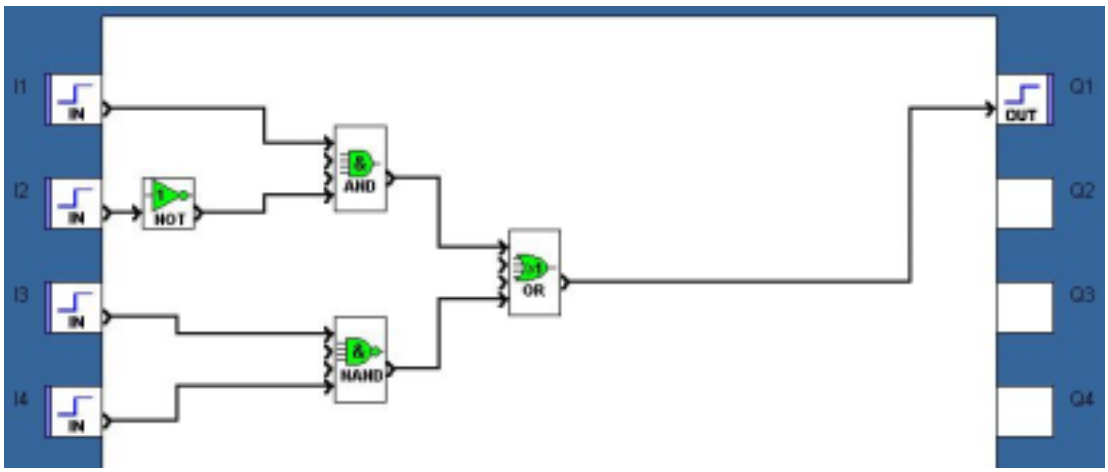


The SFC functions are like Grafcet language. The principle is simple since it concerns sequential programming, the steps succeeding one another framed by transitions. When a step is active, you must wait until the transition that follows is active to go onto the next step.

Note: An application using Grafcet functions is developed in the applications library in FBD language under the name ‘’Indoor/Outdoor Lighting of a Home’’(Level 2).

4.3.3.5 Logic Functions

For example: Q1= [I1 AND (NOT I2)] OR [I3 NAND I4]



Click on the link below to access the example:
(Ex 20)

Note: it is often possible to simplify wiring by replacing logic functions with a Boolean block.

4.4 USING THE PROGRAM

*When you have entered your program in **FBD** or **LADDER language**, you can simulate it then transfer it:*

4.4.1 Simulation Mode: Program Test

Once your program is finished, you can test it by clicking on the ‘‘**S**’’ icon at top right **(1)** or in the **Mode** menu then **Simulation**. To launch the program, click on **(RUN) (2)**, as shown below:

Forcing is achieved by clicking on the function or the input or output pin. It is unnecessary for the module to be connected to the PC to perform the simulation.

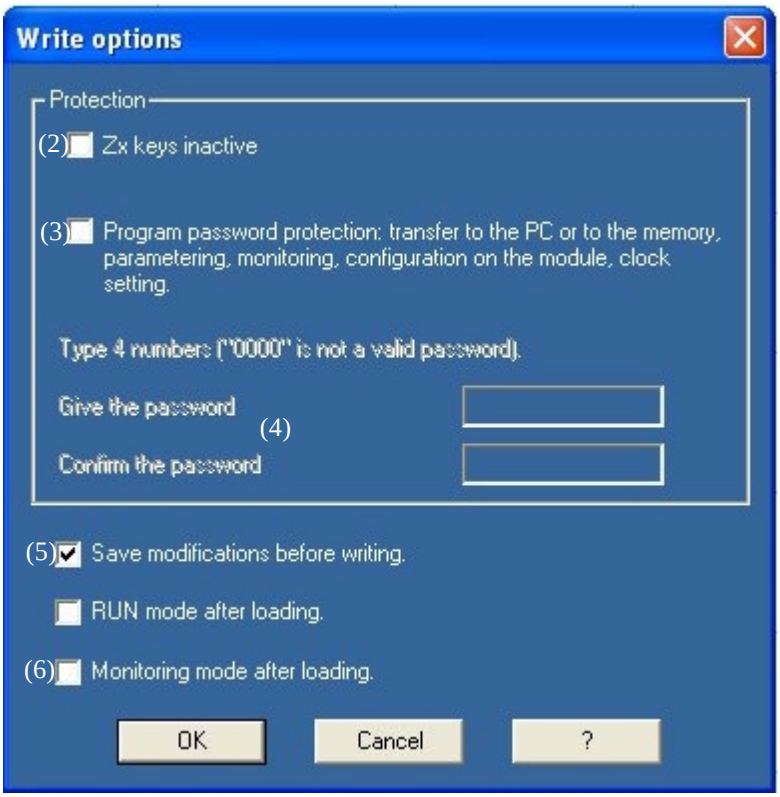
4.4.2 Application Transfer

4.4.2.1 Writing from a PC to Zelio Logic

When your application is ready, you can transfer it into Zelio Logic.

To send a program to Zelio Logic, go to the **Transfer** menu, **Transfer Program** then click on **PC->Module**.
If the type of module selected is not compatible with the type of module connected, you can change the type of module in **Module** then **Choice of Module/Programming**. It is also possible to run a diagnosis of the module connected in **Module** then **Module Diagnostic**.
If the module connected is in the **RUN** mode it is impossible to transfer the program. You can change it to the **STOP** mode using the software by selecting **Transfer** the **STOP Module**.

If the type of module selected is the same type as the module connected, the following dialogue window opens:



In **(2)** you choose to render the Zx keys (that are used in input in the program) accessible. It is possible to protect the program present in the module with a password **(3)** that you enter **(4)**. To save your application on your computer, check **(5)**. Finally to launch the monitoring mode explained below, check **(6)**.
Then click on **OK,** the program is transferred.
Note 1: The program that was present in the module before the transfer is overlayed by the module.
Note 2: When you have previously loaded a program in ladder language (if you program in FBD) or in FBD (if you program in Ladder) in the module (or on first use), the software must update the module firmware. You will be offered the option to update during transfer.

4.4.2.2 Transfer of Zelio Logic program to the PC

This transfer function enables the retrieval of an application of the module using the software.

From the software, go into the **Transfer** menu**, Transfer Program** then click on **Module-> PC**. After a request for confirmation, the transfer is executed.

The software then loads the program present in the module.

Note: If the module program is locked, the code will be provided by the module before the transfer.

4.4.3 Starting up the Module from the Software

Click on **Transfer** the **RUN Module**. However, when you transfer a program to the module, it goes into the **RUN** mode automatically.

4.4.4 Mode Monitoring: Real time monitoring

The module is connected to the PC.
This mode has the same characteristics as the simulation mode. The input or output status of Zelio logic can be visualized or changed using the software. These inputs are visible from the edit window as in the supervision window. The front panel is used to control the process and act on the keys remotely by selecting the front panel window.
To launch the monitoring mode on program transfer, check the corresponding box in the transfer window, or click on the icon in the upper right when the module is connected and contains the corresponding program.

4.4.5 Print your application

You can print a complete file of your application. Select **File**, **Print...** (when you are in the **Edit mode**)

Select the parameters you need.
Before printing, you can select **File**, **View before print.**

4.4.6 Set the time and date using the software

When your application uses clocks, it is necessary to ensure that the module's time is correct. It is possible to set the time using the software by clicking on **Module** then **Set Time**.

4.4.7 Password Function

The password protects access to a program. When you transfer your program to Zelio Logic, the write option window opens and you can check the ‘’**Protect with password’’** box. Once the password is activated, you may no longer write towards the module or read the program without knowing this password. The program is protected. If you want to access the menu and reset the time for example, you will be asked to enter the password.

4.4.8 Front Panel Lock

The front panel lock function is used to prohibit access to the menus. Locking is effective when the program is on, but also when it is off. To switch the program on or off once the lock is activated, you must use the software.
Nevertheless, Front Panel Lock does not prevent the use of the front panel buttons in a program.
When you write your program in Zelio Logic, the write option window opens. Simply check the ‘’**set lock on front panel of Module ‘’**.

For further detail, use the **on-line help** or the **operating manual**.