Telemecanique

Zelio-Logic

Smart Relay

User's Guide
June 2002

Merlin Gerin
Modicon
Square D
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Preliminary Advice on Installing Smart Relays

Power down the device.

Take all necessary measures to avoid unwanted relay triggering.

Check to ensure that no voltage is present.

Make the necessary ground and short circuit connections.

Always follow the instructions stated in this user’s guide.

Remember that only qualified personnel are authorized to implement the smart relay.

Automation and control devices must be installed so that they are protected against any risk of involuntary actuation.

It is essential to ensure that all control system connections meet applicable safety standards.

Fluctuations or variations in the supply voltage should not exceed the tolerance thresholds stated in the technical characteristics, as they may cause operating failures and lead to potentially dangerous situations.

Take care to meet the standards that apply to emergency stop systems in order to avoid potentially dangerous situations. Ensure that releasing the emergency stop system does not cause the automated system to suddenly restart.

Take all necessary measures to ensure that an application interrupted by a break in the supply voltage can continue correctly and also ensure that no dangerous states, no matter how brief, may occur.

Contents

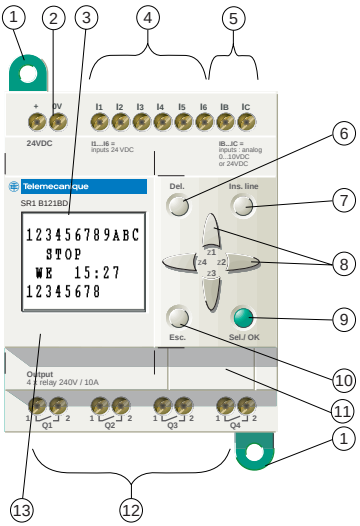
Chapter 1 - Contents
Powering up and Discovering the Smart Relay

This Chapter covers the following subjects:

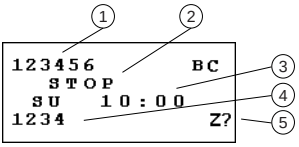
1. Presentation

Smart relays are designed to simplify the electrical wiring of intelligent solutions. A smart relay is very simple to implement. Its flexibility and its high performance allows users to save significant amounts of time and money.

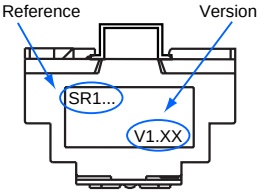
This User's Guide is intended for people who do not have an in-depth knowledge of automation systems and who would like to be able to implement smart relays.



1-Retractable mounting feet
2-Screw terminal block for the power supply
3-LCD, 4 lines, 12 characters
4-Screw terminal block for inputs
5-Screw terminal block for 0-10 Volt analog inputs usable in discrete mode on some models
6-Delete key
7-Insert line key
8-Arrow keys or after first configuring them, Z pushbuttons
9-Selection and validation key
10-Escape key
11-Connector for backup memory or PC connection cable
12-Relay output screw terminal block
13-Slot for re-writable label



1-Input status display (b and c represent the analog inputs)
2-Operating mode display (RUN/STOP)
3-Parameter display, by default the day and time for models with a clock
4-Output status display
5-Z key function display, when these keys are activated.



The smart relay's reference number and version level are shown on the label that can be seen on the side of the smart relay.

2. Characteristics and Connections

Characteristics of DC smart relays

Supply	24 VDC (min. 19.2 V/max. 30 V)		
Reference numbers	SR1-A101BD	SR1-B121BD	SR1-B122BD
Number of I/O	10	12	
Weekly clock	NO	YES	
Rated input current	83 mA		45 mA
Nbr. of discrete inputs	6	6	
Rated voltage	24 V c		
Rated current	I1 to I6: 3 mA IB, IC: 0.62 mA		
Nbr. of 0-10 V* analog inputs	0	2	
Nbr. of outputs and type	4 relay outputs		4 transistor outputs
Switching voltage	5-150 Vc / 24-250 Va		24 Vc / 0.5 A
Max. switching current	8 A		0.5 A
AC15 switching capacity	0.9 A / 230 Va		-
DC13 switching capacity	0.6 A / 24 Vc		0.5 A / 24 Vc

Supply	24 VDC (min. 19.2 V/max. 30 V)		12 VDC (min. 10.4 V/ max. 14.4 V)
Reference numbers	SR1-A201BD	SR1-B201BD	SR1-B121JD
Number of I/O	20		12
Weekly clock	NO	YES	
Rated supply current	130 mA		105 mA
Nbr. of discrete inputs	12	10	6
Rated voltage	24 V c		12 V c
Rated current	I1 to IA: 3 mA IB, IC: 0.62 mA		I1 to I6: 3 mA IB, IC: 0.21 mA
Nbr. of 0-10 V* analog inputs	0	2	
Nbr. of outputs and type	8 relay outputs		4 relay outputs
Switching voltage	5-150 Vc / 24-250 Va		
Max. switching current	8 A		
AC15 switching capacity	0.9 A / 230 Va		
DC13 switching capacity	0.6 A / 24 Vc		

* Each analog input is also usable in discrete I/O mode

2. Characteristics and Connections

Characteristics of AC smart relays

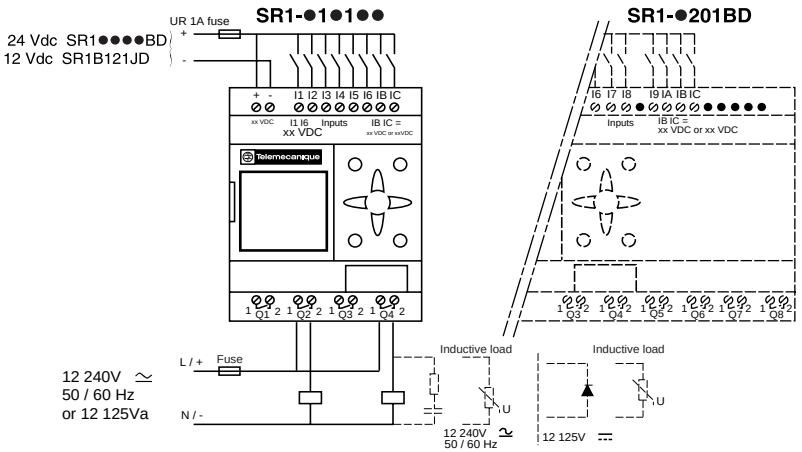
Supply	100-240 V_a (min. 85 V/max. 264 V)			
Reference numbers	SR1-A101FU	SR1-B101FU	SR1-A201FU	SR1-B201FU
Number of I/O	10		20	
Weekly clock	NO	YES	NO	YES
Rated supply current	< 50 mA to 100 V_a < 27 mA to 240 V_a		< 80 mA to 100 V_a < 40 mA to 240 V_a	
Nbr. of discrete inputs	6		12	
Rated voltage	100-240 V_a 50-60 Hz			
Rated current	0.65 mA to 115 V_a		1.3 mA to 240 V_a	
Nbr. of outputs and type	4 relay outputs		8 relay outputs	
Switching voltage	5-150 V_c / 24-250 V_a			
Max. switching current	8 A			
AC15 switching capacity	0.9 A / 230 V_a			
DC13 switching capacity	0.6 A / 24 V_c			

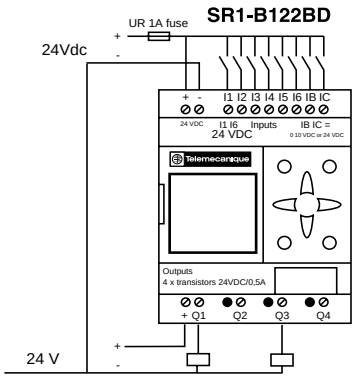
Supply	24 V_a (min. 19.2 V/max. 26.4 V)	
Reference numbers	SR1-B101B	SR1-B201B
Number of I/O	10	20
Weekly clock	YES	
Rated supply current	75 mA (outputs disabled) 200 mA (all outputs enabled)	82 mA (outputs disabled) 300 mA (all outputs enabled)
Nbr. of discrete inputs	6	12
Rated voltage	24 V c 50-60 Hz	
Rated current	3 mA	
Nbr. of outputs and type	4 relay outputs	8 relay outputs
Switching voltage	5-150 V_c / 24-250 V_a	
Max. switching current	8 A	
AC15 switching capacity	0.9 A / 230 V_a	
DC13 switching capacity	0.6 A / 24 V_c	

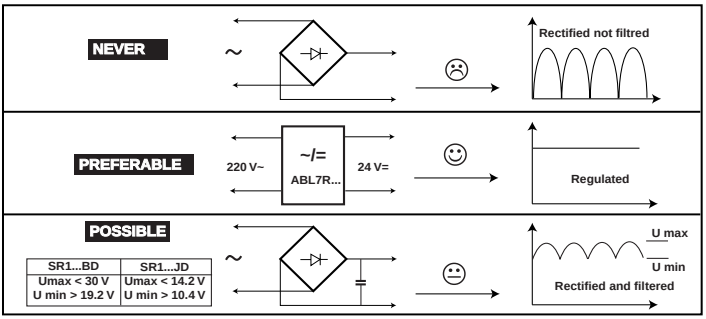
2. Characteristics and Connections

Connecting DC smart relays

SR1-●●●●BD or SR1B122BD





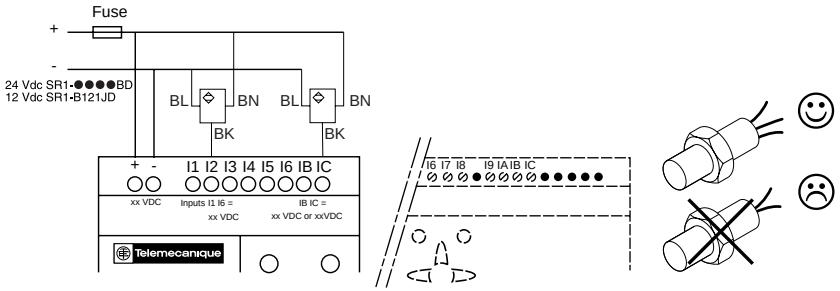


SR1...BD	SR1...JD
Umax < 30 V	Umax < 14.2 V
U min > 19.2 V	U min > 10.4 V

2. Characteristics and Connections

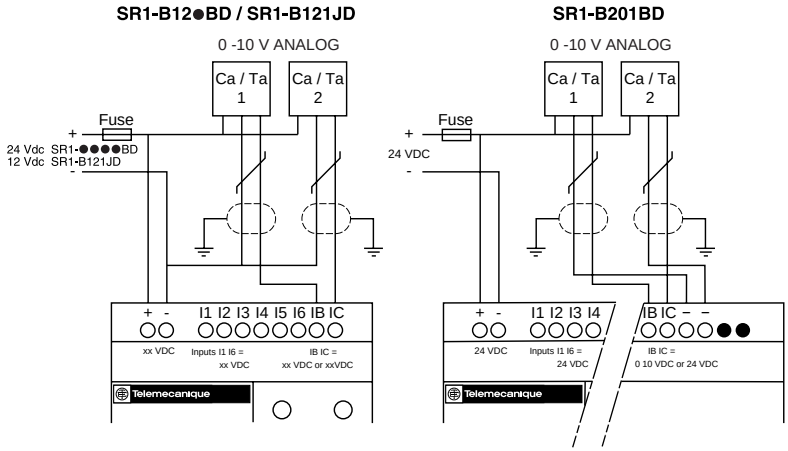
Connecting three-wire detectors

SR1-●●●●BD or SR1B121JD



Connecting analog inputs

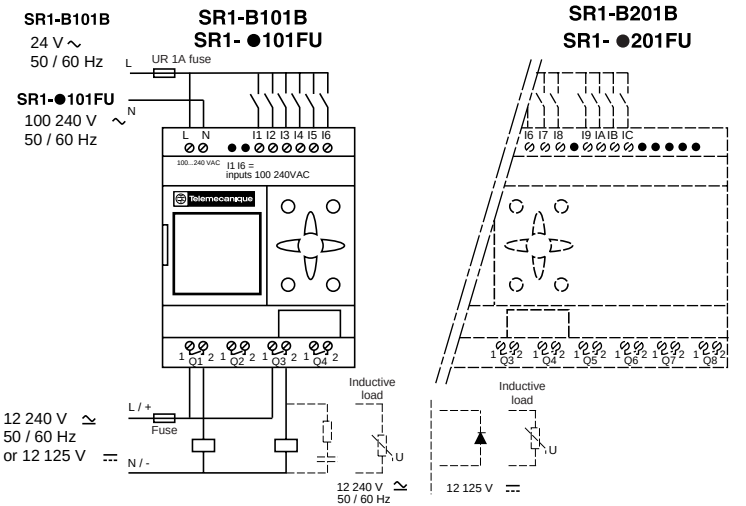
SR1-B●●●BD
SR1-B121JD - SR1E121BD



2. Characteristics and Connections

Connecting AC smart relays

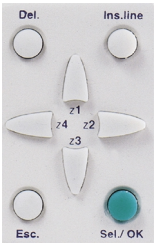
SR1-●●●●FU



3. Command Keys

Description of keys (not available on Blind modules)

The keys located on the front of the smart relay are used to configure, program and control the application.
They perform the following actions:

Key	Description
	Press this key to delete a Ladder diagram element or line.
	Press this key to insert a Ladder diagram line.
	Press this key to: Make a selection, Enter the parameter page for an element, Enter a display page, Validate a selection. To use the smart relay, the first action required is to press this key to access the main menu.
	Press this key to exit a menu or a selection.
	The arrow keys are used to move up, left, down and right. The position on screen is shown by the "**>**" indicator, a "■" or "●" cursor or the blinking text "**Ini**".

4. Examples

This sub-section details how to use the smart relay's keys.
This does not apply to Blind modules.

Example 1: Language selection - The procedure described below is always the same as long as the module has keys.

Description/Action	Display
Initial power up or power up after initialization by the manufacturer:	 The "**ENGLISH**" option blinks.
Select the required language using keys **Z1** and **Z3**, then press **Sel./ OK** to validate.  **or** **+**	 The **Sel./ OK** button is ued to validate the choice of a new language (as shown by the lozange symbol and by the text blinking).
 To continue or complete the initial power up procedure.	There are two possible cases: Product with a clock, e.g. SR1-B●●●●●  Now the time must be set (refer to the example on the next page). Product without a clock, e.g. SR1-A●●●●●  The smart relay's main screen is displayed (in this case a SR1-A101FU smart relay).

4. Examples

Example 2: *Changing the date and time when first powered up or after a long lasting power break.*
(V ≤ 1.6: 72 hours) or (V ≥ 1.7: 150 hours)

Description/Action	Display/Comments
After choosing the language, the following screen is brought up:	 The black colored cursor blinks.
 To enter Modify mode.	 The text to change blinks ("**WINTER**" in this case). You can then change it using:  **or**  **then**  Pressing **Sel./OK** validates the changes and the cursor moves to the next field, "MO" (Monday) in this case.

The hours, minutes and day of the week settings can be changed in the same way, using the smart relay keys.

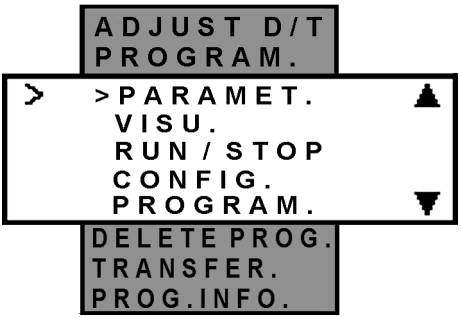
To return to the main menu, press:

Note: **The**  **or**  **keys are used to move from one field to another while the other two arrow keys are used to change the displayed values.**

Important: **There is no automatic SUMMER/WINTER time change function. Whenever a change between winter and summer time takes place, you will need to change the SUMMER/WINTER value. The current time will then be automatically updated (+ or - 1 hour).**

5. Main Functions

These are grouped in a main menu.



The "**>**" indicator located to the left of the text shows the setting of your choice.

An upwards triangle shows that there are more options available if you scroll up, while a downwards triangle shows that there are more options available if you scroll down.

Note: **The functions provided by the various menus may vary according to product reference number and software release level.**

5. Main Functions

Main menu functions

Menu	Description
TIME SET	This function is used to set the date and time: Summer/winter time Day of the week Hours-Minutes
PROGRAM.	This function lets the user enter the Ladder diagram that will make the smart module work. This program is written using a Ladder diagram. For information on how to program a Ladder diagram, refer to the next chapter. This function may be password protected.
PARAMET.	This function lets the user display and change unlocked values in function block parameters entered in the Ladder diagram.
VISU.	This function lets the user display and change unlocked function block parameters entered in the Ladder diagram. It also lets the user select data that will be displayed on the third display line on the smart relay screen.
RUN/STOP	This function lets the user start or stop the program contained in the smart relay: RUN: the program is started. STOP: the program is stopped and the outputs disabled. Counters and timers are reset.
CONFIG.	This function comprises all of the smart relay configuration options (refer to the next table).
CLEAR PROG.	This function will clear the entire Ladder diagram stored in the smart relay. This function may be password protected.
TRANSFER.	This function will transfer the contents of the smart relay memory. **Modul.** -> **PC**: transfer to the programming software, **PC** -> **Modul.**: loading by the programming software, **Modul.** -> **Mem**: transfer to the unpluggable EEPROM*, **Mem** -> **Modul.**: loading from the unpluggable EEPROM*.

5. Main Functions

Main menu functions

PROG. INFO. **or** **SOFT**	This function will display all of the components required for entering a Ladder diagram. Versions ≤ V1.6 Reminder of the smart relay's internal software release level. Versions ≥ V1.7

* The unpluggable EEPROM allows transferring the contents of the smart relay memory without the need for the programming software and without the need to enter an identical application in another smart relay. However, the smart relay can still work without an EEPROM fitted.

5. Main Functions

Configuration menu functions

Menu	Description
PASSWORD	Allows or denies access to certain functions.
LANGUAGE	Language selection.
FILT.	Input filtering mode selection (fast inputs only on SR1.....D). This function may be password protected.
Zx=KEYS	Enable/disable Zx arrow keys. This function may be password protected.
HELP	**Only available on versions ≤ V1.6.** Enable/disable automatic help.
REMANENZ	**Only available on versions ≥ V1.7.** Select the counter, timer and auxiliary relay function blocks with a value to save if a power break occurs. **By default, no variable is saved.**

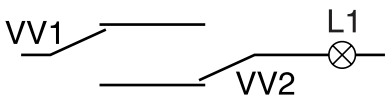
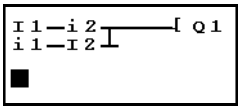
The various configuration menu options are detailed in Chapter 3, page 31.

Chapter 2 - Contents
Implementing a Basic Application

This Chapter covers the following subjects:

1. Ladder Diagram Presentation

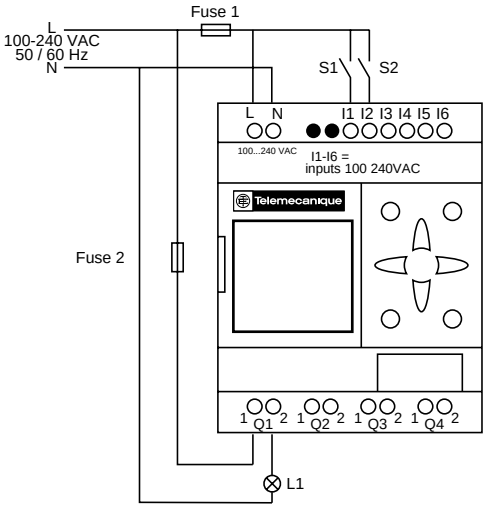
If you already know how Ladder diagrams work, you can skip straight to section 3 of this chapter.
In this section, we will use a simple example to understand how a Ladder diagram works: a two-way switch.

Normal electrical diagram	Ladder diagram
	
The two position switches identified as **VV1** and **VV2** control light **L1**.	**I1** and **I2** are two contacts representing inputs 1 and 2 on the smart relay. **Q1** is a coil that corresponds to output 1 from the smart relay.

Using a smart relay means that ordinary switches (with open or closed positions) can be used in place of two position switches.

The switches are identified as **S1** and **S2** in the wiring diagram opposite.

S1 and **S2** are connected to inputs **I1** and **I2** on the smart relay.



The operating principle is as follows:
Each time inputs **I1** and **I2** change state, this causes a change in state on output **Q1** which controls light **L1**.

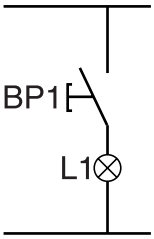
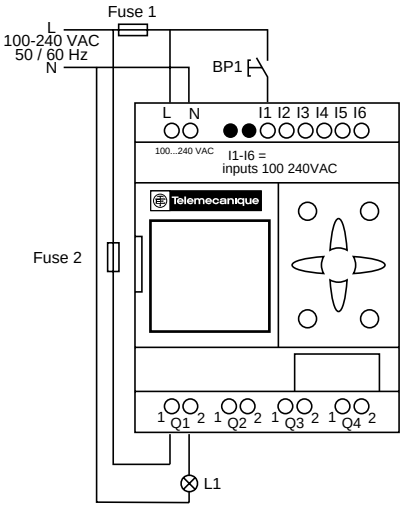
The Ladder diagram uses basic features like placing contacts in parallel and in series along with the reverse function identified as **i1** and **i2** (the reverse function is described on the next page).

Note: **The implementation of a two-way switch is optimum when remote control relay coils are used (refer to page 42).**

2. Using the Reverse Function

Practical example

The reverse function and its **i** notation in the smart relay is used to obtain the reverse state of input **I** wired on the smart relay. To illustrate how this function works, let us use a simple electrical diagram:

Electrical diagram	Connection to the smart relay
	

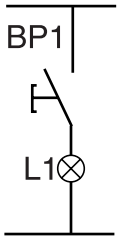
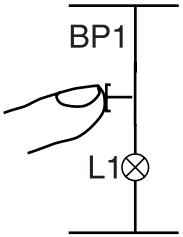
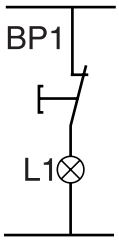
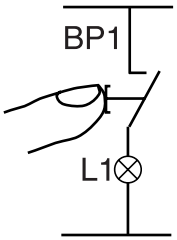
Depending on the Ladder diagram, two solutions are possible:

Ladder diagram 1 Light out when idle	Ladder diagram 2 Light lit when idle
I1————[**Q1**	**i1**————[**Q1**
I1 corresponds to the true image of **BP1**, pressing **BP1** activates input **I1** so that the **Q1** output is activated and light **L1** lights.	**i1** corresponds to the reverse image of **BP1**, pressing **BP1** activates input **I1** and therefore contact **i1** is disabled, output **Q1** is disabled and light **L1** goes out.

2. Using the Reverse Function

General case

The table below illustrates the operation of a pushbutton connected to the smart relay. Pushbutton **BP1** is connected to input **I1** and light **L1** is connected to output **Q1** on the smart relay.

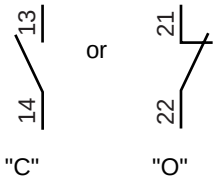
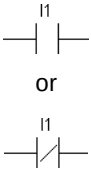
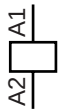
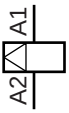
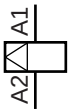
Idle		Operating	
Electrical diagram	**Zelio symbol**	**Electrical diagram**	**Zelio symbol**
	**I1 = 0** **i1 = 1**		**I1 = 1** **i1 = 0**
	**I1 = 1** **i1 = 0**		**I1 = 0** **i1 = 1**

Note: **The reverse function applies to all of the contacts in a Ladder diagram, whether they represent outputs, auxiliary relays or function blocks.**

3. Notation Used by the Smart Relay

The smart relay has a four line display used to show Ladder diagrams.

Note: **The ZelioSoft application lets you represent Ladder diagrams in three different formats.**

Electrical symbol	Ladder diagram symbol	Zelio smart relay symbol
		**I1 or i1** **I1 or i1**
		**Q1**
 Set coil (SET)		**S Q1**
 Reset coil (RESET)		**R Q1**

Other elements are also available using a smart relay:

Timer function block: used to delay, prolong and control and action for a set length of time.
Counter function block: used to count the pulses received on an input.
Clock function block: used to trigger or release actions on precise days or at precise times.
Analog comparator function block: used to compare an analog value with a reference value or with another analog value after allowing for a hysteresis factor.
Auxiliary relays: these are used to save or relay the status of the smart relay.
Z keys: after confirming this function, Z keys can be used as pushbuttons.

Note: **For more information on all of the Ladder diagram elements available when using a smart relay, refer to Chapter 4, page 40, for a detailed description.**

4. Application: Implementing a Two-way Switch

Entering the Ladder diagram

By following the indications in the table below, the user can enter the two-way switch Ladder diagram.

From the main screen (the one shown on power-up), follow the instructions in the "**Action**" column and press the specified button.

The "**Screen**" column shows what the user will see on the smart relay display screen.

The "**Comments**" column provides some additional information on entry and display actions.

Action	Screen	Comments
		The main menu is displayed, the "**>**" symbol shows that the "**PROGRAM.**" option is selected. This option blinks.
	■	After briefly displaying "**LINE 1**" (for approx. two seconds), a blinking ■ cursor is displayed.
	**I1**	The **I** blinks. The smart relay prompts the user to select the type of contact.
	**I1**	The **1** blinks. The user has implicitly selected a contact assigned to an input (**I**), the smart relay now prompts the user to select the input number.

4. Application: Implementing a Two-way Switch

Action	Screen	Comments
	I1 ■	The ■ blinks. You have just validated the contact entry to assign to input I1. The ■ is moved ready to enter the second contact.
	I1—I1	The right hand I blinks. The smart relay prompts you to select the type of contact.
	I1—i1	The i blinks. You have just selected the reverse contact assigned to an input.
	I1—i1	The right hand 1 blinks. Now enter the input number.
	I1—i2	The 2 blinks. Now simply validate this selection.
 or 	I1—i2 ■	The ■ blinks. Move to the end of the line ready to enter the coil.
	I1—i2 ●	The ● blinks, indicating a link point for linking connections.
	I1—i2 ■	The ■ blinks. Now enter the coil.
	I1—i2———[Q1	The Q blinks. Now all that remains is to select the other parameters for this coil.

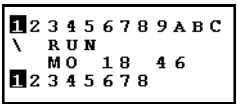
4. Application: Implementing a Two-way Switch

Action	Screen	Comments
	I1—i2————[Q1	The **1** blinks. Coil **Q** is validated.
	I1—i2————[Q1	The [blinks. The coil number is validated.
	I1—i2————[Q1 ■	The ■ blinks. The coil is validated in **contact** position. The ■ moves down a line and the links are displayed automatically.
	I1—i2————[Q1 I1	The **I** located on the second line blinks.
	I1—i2————[Q1 i1	The **i** located on the second line blinks.
	I1—i2————[Q1 i1	The **1** located on the second line blinks.
	I1—i2————[Q1 i1 ■	The ■ blinks.
	I1—i2————[Q1 i1—I1	The **I** located on the second line blinks.
	I1—i2————[Q1 i1—I1	The second **1** in the second line blinks.
	I1—i2————[Q1 i1—I2	The **2** located on the second line blinks.

4. Application: Implementing a Two-way Switch

Action	Screen	Comments
	I1—i2———[Q1 i1 I2 ■	The ■ blinks. Now enter the link between the two lines.
	I1—i2———[Q1 i1—I2 ●	The ● blinks. This shows that it is possible to connect a link at this point.
	I1—i2———[Q1 i1—I2 +	The ● has changed into a blinking + and this shows that it is now possible to set the link between the two lines.
	I1—i2┐ i1—I2┘———[Q1	The contact point blinks showing a + sign. Now validate this change.
	I1—i2●———[Q1 i1—I2┘	The contact point blinks showing a ● sign. The validation is made, now exit the diagram zone.
	>PROGRAM. ▲ PARAMET. VISU. RUN/STOP ▼	The screen displays the main menu. Now start the smart relay (set to **RUN**).
Press the key three times 	PROGRAM. ▲ PARAMET. VISU. >RUN/STOP ▼	The "**>**" sign indicates that the "**RUN/STOP**" option is selected. This option blinks. Now simply validate the setting to **RUN**.
	RUN PROG ? >YES NO	The smart relay prompts you to validate the setting to **RUN**.

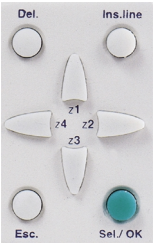
4. Application: Implementing a Two-way Switch

Action	Screen	Comments
		The smart relay is now set to RUN. To monitor its operation, return to the main screen.
		This screen lets you display two-way switch operation (switch action, indicator lights on or off, light on or off).

This simple application example teaches the user how to enter a Ladder diagram. The following points should be remembered:

When a ■ or a ● blinks, use the **Sel/OK** button to add an element (contact, coil or graphic link element).

When an element blinks (**I, Q**, No., , …), it is possible to use the **Z1** and **Z3** arrows on the arrow key pad to select the required element.



It is also possible to use the **Z2** or **Z4** arrows on the arrow key pad to select the previous or the next element (or the next part of the currently selected element).

Chapter 3 - Contents
Configuration Menu

This Chapter covers the following subjects:

1. Password Function "PASSWORD"

Password purpose

The password secures access to the following main menu options: **"PROGRAM"**, **"CLEAR. PROG"**, **"FILT."**, **"REMANENZ"**, **"Zx=KEYS"**, as well as to the two application transfer options **Module to PC** and **Module to EEPROM**.

Note: **This password comprises four digits from 0 to 9. It is entered using the keys on the smart relay. By default it is disabled.**

Entering the password

Action	Display	Comments
Select the "**PASSWORD**" option from the "**CONFIG.**" menu.	**PASSWORD**  **? ? ? ?**	The  means that no password is set yet.
	**PASSWORD**  **0 0 0 0**	The **0** on the right blinks. Now enter the password.
Enter the password using the arrow keys **Z1**, **Z2**, **Z3**, **Z4**.	**PASSWORD**  **3 0 2 0**	The digit being changed blinks. Now validate the entry made.
	**PASSWORD** 	This screen is displayed for two seconds (the password is activated) and the user is returned to the main menu.

Canceling password protection

To cancel password protection, simply enter the current password (see above). The password is inhibited and the smart relay displays a transitory screen showing an open padlock symbol. If you have forgotten your password, refer to Chapter 8, page 88.

Changing the password

To change the password, simply cancel the former one and enter a new one (refer to the method described above).

2. Language Selection Function "LANGUAGE"

This function lets the user choose the language used by the smart relay. All messages can be displayed in six languages: English, French, German, Italian, Spanish and Portuguese.

Example: Language selection screen.

In this example, French is chosen.

Note: **No language selection can be made with the smart relay in RUN.**

Using the "Ini." function

When the **Ini.** function is selected, the next time the smart relay is powered up, it prompts the user to select a language and enter the time (for smart relays with a clock function).

The smart relay program and configuration are saved in all cases.

3. Fast Input Function "FILT."

This function allows faster detection of changes in states on the inputs. This mode should only be used when necessary as it makes the smart relay's inputs more sensitive to interference and signal bounce.

Two choices are available: "FAST" and "SLOW". This function is only available on **DC** smart relays.

Note: **This choice can only be made when the smart relay is set to STOP. By default, smart relays are configured to run in "SLOW" mode.**

Filtering	Switching	Response time
SLOW	ON->OFF	5 ms
	OFF->ON	3 ms
FAST	ON->OFF	0.5 ms
	OFF->ON	0.3 ms

The other (AC) smart relays only have one set filtering value that cannot be changed and which is dependent on the supply voltage. Refer to the technical characteristics provided in the Catalog.

4. Arrow Keys Function "Zx=KEYS"

The "**Zx=KEYS**" option lets the user enable or disable the use of arrow keys as pushbuttons.
When these keys are disabled, they are only available for setting parameters, configuring and programming the smart relay.
When they are enabled, it is also possible to use them in a Ladder diagram.
They work like pushbuttons without the need to use a terminal block input contact.
When the arrow keys are used as pushbuttons and the user calls up a menu, priority is given to moving around the menus.

Representation	Function	No.	Description
ZNo.	Normally open	1 to 4	Representation of the smart relay's arrow keys, this contact shows the state of the corresponding key. **Z1** Up arrow **Z2** Right arrow **Z3** Down arrow **Z4** Left arrow
zNo.	Normally closed		

Note: **By default, this function is disabled.**
Refer also to Chapter 6.2 for how to use them dynamically.

5. Help Function "HELP"

Available on smart relay versions ≤ V1.6.

This function lets the user enable or disable the automatic help funciton when performing a smart relay parameter setting or programming action.

When the help function is enabled, simply remain on the required element for a few seconds without pressing on a key and help will be displayed in the form of an explanation screen.

To exit the screen, press the 

or 

buttons.

Example of a help screen:

When setting function block parameters, holding position over the padlock symbol will cause the "**modif. param.**" message to appear. Locking does indeed stop the function block from being displayed in the parameter window.

6. Data Backup Function "REMANENZ"

Available on smart relay versions ≥ V1.7.

This function is used to backup the following data in the event of a power break:

- The status of the **M** auxiliary relays used in pulse mode ∫ **M**No. or in Set/Reset **R M**No and **S M**No. mode.
- The count values for counters **C**1 to **C**5.
- The elapsed time values for timers **T**1 and **T**2.

By default, no data is backed up and stopping the smart relay resets all of the values including the values backed up from the **REMANENZ** menu.

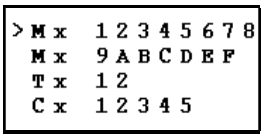
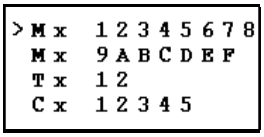
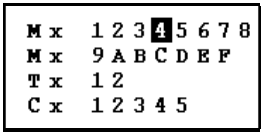
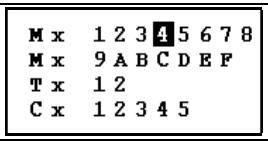
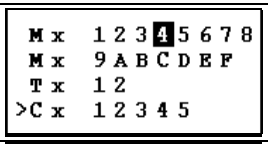
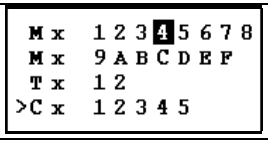
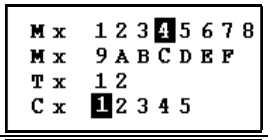
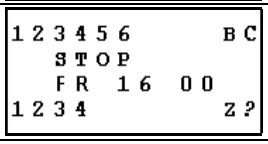
Example:

To backup the status of auxiliary relay **M**4 and the counting value from counter **C**1.

Note: **This operation can only be performed when the smart relay is stopped.**

Action	Display	Comments
Using the **Sel./OK** key and keys **Z1** and **Z3**, go to the main menu and select **"CONFIG."**	PARAMET. ▲ VISU. RUN/STOP >CONFIG. ▼	**"CONFIG."** blinks as it is selected.
Using the **Sel./OK** key and the **Z3** key, select **"REMANENZ"**	LANGUE ▲ FILT. Zx=Touches >REMANENZ	**"REMANENZ"** blinks as it is selected.
	>Mx 12345678 Mx 9ABCDEF Tx 12 Cx 12345	Data that can be backed up is displayed in reverse video if already backed up.

6. Data Backup Function "REMANENZ"

Action	Display	Comments
		Line **M**x no longer blinks, only the 1 corresponding to **M**1 blinks.
 Press **Z2** three times to reach 4		The 4 corresponding to **M**4 blinks.
 or 		Data shown in reverse video is backed up, **M**4 in this case.
		The entire **M**x line blinks.
 Press **Z3** three times to reach **C**x		The entire **C**x line blinks.
		The 1 corresponding to **C**1 blinks.
		Data shown in reverse video is backed up, **M**4 and **C**1 in this case.
 then 3 x 		Back to the main screen.

Chapter 4 - Contents
Ladder Diagrams

This Chapter covers the following subjects:

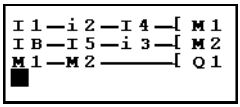
1. Introduction

This Section details all possible elements in a Ladder diagram that are recognized and used by the smart relays.
To better understand the functions performed by each element, where necessary a directly usable example is included.

The logic modules accept 60 line Ladder diagrams for 10 I/O and 12 I/O smart relays and 80 line ones for 20 I/O smart relays.

Note: **Each line comprises a maximum of three contacts and must always include a coil. When the application requires more than three contacts to activate an action, the auxiliary relays can be used as shown in the example below.**

Ladder diagram example:



2. Discrete Inputs

A discrete input can only be used as a contact.

Representation	Function	No. on terminals	Description
INo.	Normally open	1 to C depending on smart relay	The physical input to the smart relay. This contact gives the state of the sensor (switch, detector,…) connected to the corresponding input.
iNo.	Normally closed		

Example 1:

I1——————**[Q1**

When input **I1** contact is closed, output **Q1** is activated.

Example 2:

i1——————**[Q1**

When input **I1** contact is open, output **Q1** is activated.

Note: **When analog inputs Ib and Ic are entered as contacts, they automatically operate as discrete inputs.**

3. Discrete Outputs

A discrete output can be used either as a coil or a contact.

Used as a coil

Usage mode	No. on t. block	Description
┤[Q No.	1 to 8 depending on smart relay	The coil is energized if the contacts that it is connected to are closed ones, else it is not energized.
┤⎍ Q No.		Pulse supply, the coil is energized by a change of state. This is the same as an alternating control relay.
S Q No.		"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.
R Q No.		"Reset" (Unlatch) coil, also called a release coil. This coil is disabled when the contacts that are connected to it are closed. It remains idle even if the contacts are no longer closed.

Used as a contact

Representation	Function	No. on t. block	Description
Q No.	Normally open	1 to 8 depending on smart relay	The physical output from the smart relay. An output can be used as a contact to determine its state at a given time.
q No.	Normally closed		

Example 1:

Q1——————┤[Q2

When output **Q1** is activated, output **Q2** is also activated.

Example 2:

q1——————┤[Q2

When output **Q1** is disabled, output **Q2** is activated. Output **Q2** will always take the reverse state to output **Q1**.

3. Discrete Outputs

Note: **The ⌡ and ⌡[, SET (Latch) and RESET (Unlatch) functions must be used once and once only for each coil in a Ladder diagram.**

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

If not, then during operaton there is always the risk of generating unexpected switching states.

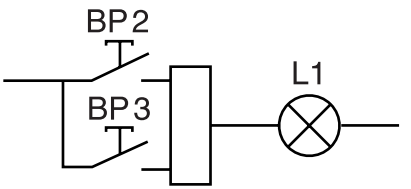
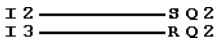
Example - Using a remote (alternating) control relay

I1————⌡ Q1

This is a very handy function that allows lighting and extinguishing a light using a pushbutton. If a pushbutton is connected to input **I1** and a light to output **Q1**, then each time the button is pressed, the light will come on if it was off or it will go off if it was on. To set up a two-way switch, simply connect the inputs in parallel and connect a pushbutton to each input.

Example - Using Set (Latch) and Reset (Unlatch) coils

To control the power supply to a device using a pushbutton to cut off the power supply to the same device. The following solution is applied:

Electrical diagram	Smart relay solution
	

Pushbutton BP2 is connected to the smart relay, to input I2 and pushbutton BP3 to input I3. The device to control, in this case a light bulb called L1 is connected to output Q2.
Pressing pushbutton BP2 will light the bulb.
Pressing pushbutton BP3 will extinguish the bulb.

Note: **The RESET (Unlatch) order takes priority over the SET (Latch) order.**

4. Auxiliary Relays

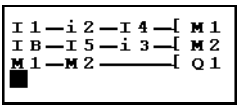
The auxiliary relays, **M** in the notation used, operate just like the output coils **Q**. The only difference is that they do not have any connection terminals.

There are 15 auxilary relays (numbered in hexadecimal notation from 1 to 9 and from A to F).

They are used to save or forward a state. The saved or forwarded state will then be used as the asigned contact.

Example - Using an auxiliary relay

Using two auxiliary relays to save the position of a number of inputs. The forwarded state is then used to control a coil.



This type of Ladder diagram is often used to control the various states of a device.

Behavior of the Set, Reset and Remote relay coils after a power break

When power returns, all of these coils are automatically reset and therefore disabled.
If the application requires it, their state may be saved so that it can be retrieved after power returns.
This feature is offered by smart relays running software version ≥ V1.7. (refer to Chapter 3.6 Data Backup Function - "REMANENZ" Menu).

5. Arrow Keys (Not allowed on Blind modules)

The arrow keys work just like the physical inputs **I**. The only difference is that they do not have any connection terminals.

There are four arrow keys (**Z1, Z2, Z3, Z4**).

They are used as pushbuttons.

They can only be used as contacts :

Representation	Function	No. on the s. relay	Description
ZNo.	Normally open	1 to 4	Representation of the arrow keys on the smart relay. This contact gives the state of the corresponding key. **Z1** Up arrow **Z2** Right arrow **Z3** Down arrow **Z4** Left arrow
zNo.	Normally closed		

Note: **So that the arrow keys may be used in this way, first check that they are activated in the "Zx=KEYS" option in the "CONFIG." menu. Z? will then be displayed on the operating display.**
If not, when the smart relay is in RUN mode, these keys are only used to move within the menus.

Access to the "Zx=KEYS" function is locked out when password protection is activated.

Example - Using the "Up Arrow" key

This example shows how to set up a remote (alternating) control relay that will work using key **Z1** and output **Q1**.

Z1——————⌠ Q1

Output **Q1** changes state each time you press 

6. Clock Function Block

The Clock function block is used to validate time slots during which actions can be performed. It acts just like a programmable weekly timer and has four operating ranges (A, B, C, D) used to control its output.

The block's parameter settings are accessible in two ways:

- When entering a Ladder diagram line,
- From the "**PARAMET.**" menu, if the function block is not padlocked.

The following contacts can be used in a Ladder diagram:

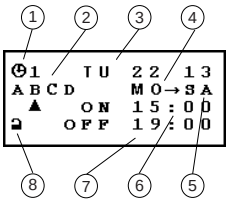
Clock function block contacts

Representation	Function	No.	Description
No.	Normally open	1 to 4	The contact is closed when the Clock is in an enabled period.
No.	Normally closed		The contact is closed when the Clock is not in an enabled period.

6. Clock Function Block

Clock function block parameters

1 - Block number
2 - Operating ranges
3 - Current date and time
4 - Start day
5 - End day
6 - Start time
7 - Stop time
8 - Block locking



Parameter		Description
Block number	①	Four blocks can be used, numbered from 1 to 4. This parameter cannot be changed in the screen shown above. It is chosen when the block is entered in the Ladder diagram line.
Operating ranges	②	Four operating ranges are available: A, B, C, D. During operation, these ranges are cumulated: the block is valid over all of the selected ranges.
Current date and time	③	This date corresponds to the day of the week (Monday to Sunday).
Start day	④	For each range, a start of validity day (Monday to Sunday) is specified.
End day	⑤	For each range, an end of validity day (Monday to Sunday) is specified.
Start time	⑥	For each range, a start operating time (00:00 to 23:59) is specified.
End time	⑦	For each range, a stop operating time (00:00 to 23:59) is specified.
Block locking	⑧	Each Clock block may be locked or left unlocked. When locked, the Clock function block no longer appears in the "**PARAMET.**" menu.

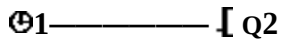
When validating Clock block parameters (exiting the screen using the **Esc** key), the smart relay displays a summary of the block's validity ranges so that the user can check the data that they entered.

6. Clock Function Block

Example - Time management using a Clock function block

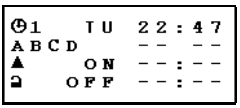
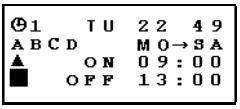
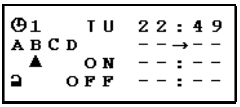
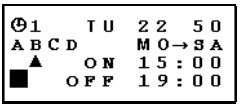
To control a device from Monday to Saturday during two time slots: from 09:00 to 13:00 and from 15:00 to 19:00. The device is connected to smart relay output **Q2** and Clock function block 1 is used.

The Ladder diagram control line is as follows:



When **1** is entered, the user must specify the operating ranges.

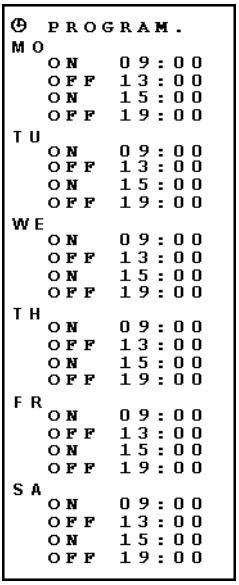
Note: **The following keys are used, Sel./OK to select or validate a parameter, Z1 and Z3 to change the value of the selected parameter, Z2 and Z4 to move from one parameter to another.**

Screen	Comments
	First data entry screen. It is displayed blank and its various parameters are filled-in using the arrow keys.
	The first range (A) has just been entered: from Monday to Saturday from 09:00 to 13:00. Now enter the second range.
	The second range has now been chosen. It is displayed blank. Now enter the times for this new range.
	The second range has just been entered: from Monday to Saturday from 15:00 to 19:00. Now simply exit the data entry screen by pressing **Esc.**

Note: **The example described in Chapter 7 describes another way of using time slots. It is possible to mix the two in order to resolve complex cases.**

Once data entry is complete, the smart relay displays a summary table that shows all of the operating ranges. To scroll it, use the arrow keys.

The example entered on the previous page results in the following summary table:



To return to entering Ladder diagram lines, press **Esc.**

7. Counter Function Block

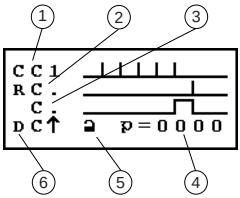
The Counter function block is used to up or down count pulses. It can be reset and a graphic element used as a contact will show whether the preset value has been reached.

Function block parameter setting can be accessed: when entering the coil that represents the counter input (**C**No. in the notiation used) in the Ladder diagram line.
The "**PARAMET.**" menu is used to change the preset value if the function block is not padlocked.

Counter function block contacts

Representation	Function	No.	Description
CNo.	Normally open	1 to 8 (1 to A on Version ≥ 1.7)	The contact is closed when the counter reaches the preset value.
cNo.	Normally closed		The contact is closed until the counter has reached the preset value.

Counter function block coils and parameters



1 – Counter input
2 – Reset input
3 – Counter output - when the preset is reached
4 – Value to reach - also called the preset value
5 – Block preset value locking
6 – Counter direction input (up/down counting)

Note: **This screen is only displayed when the coil corresponding to the counter input is entered.**
The only parameter that can be changed is the preset value. Its value is between 0 and 9999.

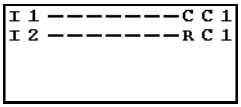
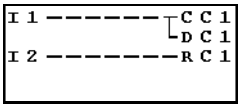
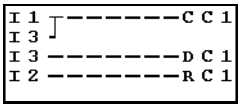
When a point is displayed in this screen, it indicates that the element was not used in the Ladder diagram lines.

7. Counter Function Block

Element	Description/Use	Example
CC	Used as a coil in a Ladder diagram, this element represents the block's counter input. Each time the coil is triggered, the counter increments or decrements by 1, depending on the chosen counting direction.	Application example: Upcounting on the input to the Counter No.1 function block. **I1**——————— **CC1**
RC	Used as a coil in a Ladder diagram, this element represents the reset input for the Counter block. Triggering the coil will reset the current count value to zero.	Application example: Resets Counter No.1 when the Up Arrow key is pressed on the arrow keypad: **Z1**——————— **RC1**
DC	Used as a coil in a Ladder diagram, this element represents the counter input that determines the direction of counting. If this coil is triggered, the function block downcounts, if not the function block counts. By default (this input is not wired) the function block counts.	Application example: Up or downcounting, depending on the status of a smart relay input. **I2**——————— **DC1**
p=0000	Value to reach. This value is also called the preset value. When the current counter value equals the preset value, then the counter C contact is closed. This value can be changed from the previously described screen and also from the "**PARAMET.**" menu.	
🔒	This parameter is used to lock the Counter function block's preset value. When the function block is locked, the preset value no longer appears in the "**PARAMET.**" menu.	
C or **c**	Used as a contact, this Counter function block element indicates that the preset value and the current value are equal.	Application example: Lighting an indicator light connected to smart relay output **Q1** when the preset value is reached. Else the indicator light is out. **C1**———————[**Q1**

7. Counter Function Block

Example - Using a Counter function block

Screen	Description
	**Upcount and reset:** The counter is incremented each time input **I1** is activated. The counter is reset when input **I2** is activated.
	**Downcount and reset:** The counter is decremented each time input **I1** is activated. The counter is reset when input **I2** is activated.
	**Upcount, downcount and reset:** The counter is incremented each time input **I1** is activated. The counter is decremented each time input **I3** is activated. The counter is reset each time input **I2** is activated.

Note: **On power return after a power break, the counting values are reset. It is possible to save the number of pulses already counted by smart relay versions ≥ V1.7 (refer to Chapter 3.6 Data Backup Function "REMANENZ" Menu).**

The preset values (values to reach) are always backed up regardless of the smart relay version level.

The maximum frequency of count pulses is:
- 60 Hz for DC supplied smart relays
- 10 Hz for AC supplied smart relays

8. Timer Function Block

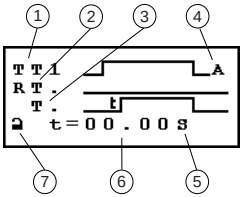
The Timer function block is used to delay, prolong and control actions during a set period of time. It has a reset input, a command input and an output used to indicate timer time-out.

The function block's parameter settings can be accessed when entering the control coil (**TT**No. in the notation used) in the Ladder diagram line. The "**PARAMET.**" menu is used to change the preset value if the function block is not padlocked.

Timer function block contacts

Representation	Function	No.	Description
TNo.	Normally open	1 to 8 (1 to A for Version ≥ 1.7)	The operation of this output contact depends on Timer parameter settings. The possible parameter settings are described in the remainder of this paragraph.
tNo.	Normally closed		

Timer function block coils and parameters



1 – Timer control input
2 – Timer reset input
3 – Timer output (or when the Preset time is reached)
4 – Type of Timer (eight possible types, refer to the next page)
5 – Preset time unit
6 – Preset time, the time value to be reached
7 – Timer preset value lock

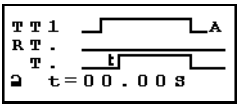
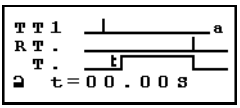
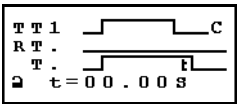
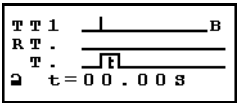
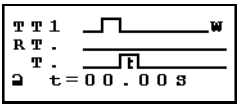
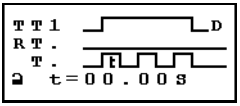
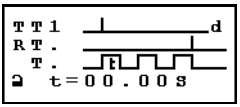
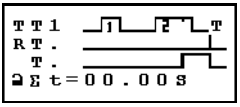
Nota : **This screen is only displayed when the coil corresponding to the Timer control input is entered.**

When a point is displayed in this screen, it indicates that the element was not used in the Ladder diagram lines.

8. Timer Function Block

Element	Description/Use
TT	Used as a coil in a Ladder diagram, this element represents the Timer function block control input. Its operation depends on the type used (refer to the table on the next page for further details).
RT	Used as a coil in a Ladder diagram, this element represents the reset input. Triggering the coil will reset the current Timer value: The T contact is disabled and the block is ready for a new timer cycle.
Type	There are eight types of Timer. Each type triggers a specific kind of operation used to handle all possible cases in an application. The table on the next page provides a detailed description of these eight types.
t=00.00	Preset value, or the timer value to be reached. The effect of this value varies depending on the type used. Refer to the table on the next page for further details.
s	Preset value time unit. There are four possible cases: 1/100ths. of a second: **00.00 s** Maximum: 99.99 1/10ths. of a second: **000.0 s** Maximum: 999.9 Minutes:Seconds: **00:00 M:S** Maximum: 99:59 Hours:Minutes: **00:00 H:M** Maximum: 99:59
	This parameter is used to lock the Timer function block preset value. Once locked, the preset value is no longer displayed in the "**PARAMET.**" screen.
T or **t**	Used as a contact, this function block element represents the Timer output. Its operation depends on the type selected (refer to the table on the next page for further details).

8. Timer Function Block

Type	Description
	**Type A:** Trigger delay (working contact delay). Example: To delay triggering a contactor to limit the current level required.
	**Type a:** Trigger delay on a control pulse rising edge with reset.
	**Type C:** Trigger delay (idle contact delay). Example: To maintain fan operation after stopping the engine.
	**Type B:** Calibrated pulse on the control input rising edge (passage contact). Example: To trigger a timed lighting circuit using a pushbutton and a timer.
	**Type W:** Calibrated pulse on the control input falling edge. Example: A pulse triggered brake control function triggered after a power supply break.
	**Type D:** Symmetrical blinker. Example: Indicating a failure using a flashing light.
	**Type d:** Symmetrical blinker triggered by the rising edge on the control input with a reset function. Example: A blinking alarm indicator and acknowledgment function.
	**Type T:** A totalizing count with reset. Example: To request the replacement of a filter when the recommended service life is exceeded. **(Function not available on versions ≥ V1.7)**

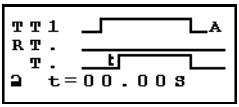
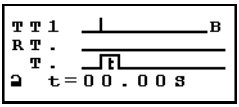
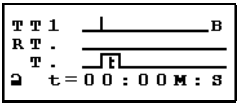
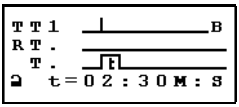
8. Timer Function Block

Example - Using a Timer function block

Implementing a stairway lighting timer:
The pushbuttons on each floor are connected to smart relay input **I1**.
The Timer No.1 function block set for a two minute and thirty second duration controls output **Q4**.
Output **Q4** is connected to the lighting system.

The Ladder diagram control lines are as follows:
I1——————— TT1
T1——————— [Q4
When entering **TT1** the Timer function block parameters must be set.

Note: **The following keys are used, Sel./OK to select or validate a parameter, Z1 and Z3 to change the value of the selected parameter, Z2 and Z4 to move from one parameter to another.**

Screen	Comment
	This is the first screen. First select the type of Timer function block.
	Once the type of Timer function block is selected: type B, calibrated pulse, then select the time base.
	Once the time base is selected **M:S**, enter the required duration.
	Once the duration has been selected, parameter setting is complete. Press **Esc.** to return to Ladder diagram line entry.

Note: **To start the timer, do not forget to set the smart relay to RUN.**

8. Timer Function Block

Behavior after a power break

If a power break occurs while a timer function block is running, any time already passed is lost.
When the supply voltage returns, the time function block is initialized for a new operating cycle.

If the application requires it, the time already passed can be saved before the power break occurs on smart relay version ≥ V1.7 (refer to Chapter 3.6 Data Backup Function "REMANENZ" Menu).

Stopping the smart relay will initialize the timer function blocks.

9. Analog Function Block

Analog function blocks can be used with smart relays equipped with a clock and supplied by DC.
These smart relays allow the use of two discrete inputs called **IB** and **IC** that can accept values from 0 to 10V.

Analog function blocks are used to compare a measured analog value with an internal reference value and also to compare two measured analog values.
The result obtained from this comparison is used in the form of a contact.

Function block parameter settings can be accessed when entering the contact representing the analog function block (**A**No.) in the Ladder diagram line.
The "**PARAMET.**" menu lets the user change the reference or the hysteresis value depending on the type of function block chosen, if the function block is not padlocked.

Analog function block contacts

Representation	Function	No.	Description
ANo.	Normally open	1 to 8	The contact shows the position of a measured analog value in relation to a reference value or it represents a comparison between two measured analog values. It's value depends on the type of analog function block chosen and configured.
aNo.	Normally closed		

Note: **An analog function block is only used as a contact.**

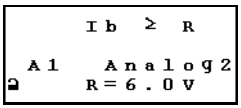
9. Analog Function Block

Example - Using an analog function block

To control a heating element using smart relay output Q1 when the temperature level is below 20°C.

A temperature sensor is used, providing a 0-10 volt signal for a -10° to +40°C temperature range.

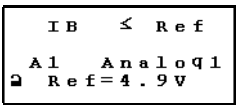
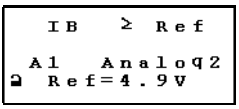
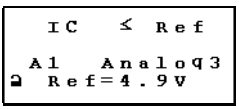
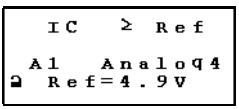
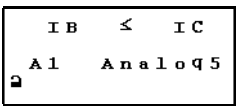
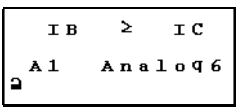
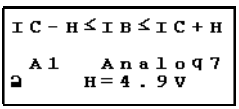
A temperature of 20°C corresponds to a voltage level of 6 volts on the sensor.

Screen	Comments
	Analog function block contact A1 is used to control output Q1.
	Analog function block contact A1 is configured as follows: Ib >= Reference Reference voltage = 6.0 volts

9. Analog Function Block

Analog function block parameters

When entering a contact in a Ladder diagram line, the user must state the type of analog function block used. Each type has its own specific parameters and operating mode described in the table below.

Type of function block	Description
	Contact **A1** is closed when the value of analog input **Ib** does not exceed the reference voltage entered in the **Ref**. field, 4.9 V in this example.
	Contact **A1** is closed when the value of analog input **Ib** equals or exceeds the reference voltage entered in the **Ref**. field, 4.9 V in this example.
	Contact **A1** is closed when the value of analog input **Ic** does not exceed the reference voltage entered in the **Ref**. field, 4.9 V in this example.
	Contact **A1** is closed when the value of analog input **Ic** equals or exceeds the reference voltage entered in the **Ref**. field, 4.9 V in this example.
	Contact **A1** is closed when the value of analog input **Ib** does not exceed the value of analog input **Ic**.
	Contact **A1** is closed when the value of analog input **Ib** equals or exceeds the value of analog input **Ic**.
	Contact **A1** is closed when the value of analog input **Ib** is between **Ic-H** and **Ic+H**. H (hysteresis) is entered in the **H** field, 4.9 V in this example.

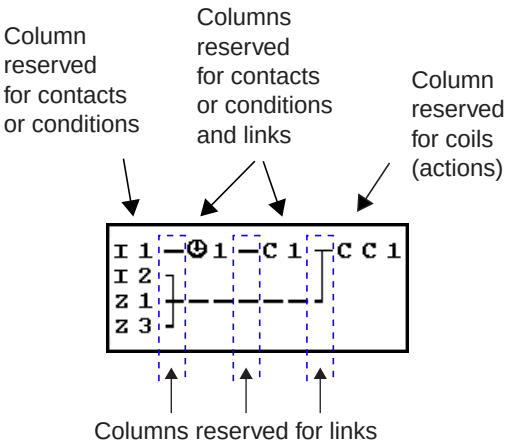
The 🔒 (padlock) is used to lock the analog function block. If this block is locked, the reference voltage or the hysteresis value (depending on the chosen type) no longer appears in the "**PARAMET.**" menu.
When the function block is unlocked, the admissible values are between 0 and 9.9 Volts.

Chapter 5 - Contents
Entering Ladder Diagrams

This Chapter covers the following subjects:

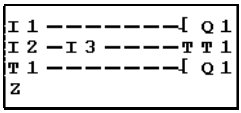
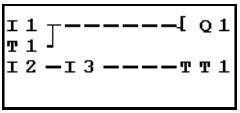
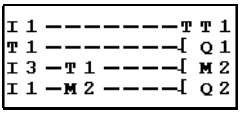
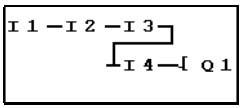
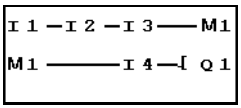
1. Rules for Editing Ladder Diagrams

A smart relay lets you enter 60 line (with SR1.1 smart relays) or 80 line (with SR1.2 smart relays) Ladder diagrams.
The smart relay's display screen can be used to display these lines, four at a time, in the following way:

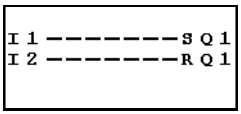
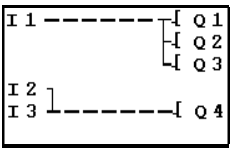
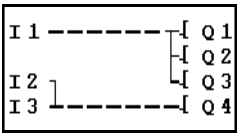


Each line comprises three fields each with two characters reserved for contacts (= conditions). The middle two columns can also be used to host links. The last three character column is reserved for coils (= actions).

Links must be entered between the contact and coil columns.

Rules	Incorrect	Correct
Each coil must only be entered once in the right hand column		
Contacts and coils can be entered as many times as necessary in the three left hand columns		
Links must always run from left to right		

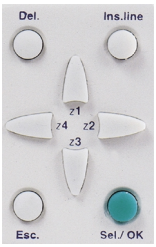
1. Rules for Editing Ladder Diagrams

Rules for entering control diagrams		
R (Reset) (Unlatch) coils always have priority over **S** (Set) (Latch) coils		**I1 = 1** **I2 = 1** **=> Q1 = 0**
To save Ladder diagram lines, proceed as follows		
If **S** (Set) (Latch) coils are used in a Ladder diagram	If no **R** (Reset) (Unlatch) coils are used, the corresponding coil will always be set to 1.	An **R** (Reset) (Unlatch) coil must be used for reset purposes.
If function blocks are used in a Ladder diagram	If no parameters are set, the contacts assigned to the block are always idle.	The block must be configured to obtain the required operation.

Note: **Smart relays run programs from top to bottom and from left to right. Sampling time is approx. 6 ms for 60 Ladder diagram lines and 8 ms for 80 lines.**

2. Editor Environment

A Ladder diagram is entered into the smart relay using the front panel keys. The key functions are listed in the table below:

Key	Description
	Press this key to delete a Ladder diagram element or line.
	Press this key to insert a Ladder diagram line.
	Press this key to: - Make a selection, - Edit an element's parameter page, - Edit a display page, - Validate a selection made. For example, when a blinking ■ is displayed while entering a Ladder diagram, pressing this key will call-up the "selection" mode used to choose the required contact or coil.
	Press this key to exit the current screen after making the required changes or to cancel the current Ladder diagram entry. For example, after changing a function block's parameters, press this key to return to Ladder diagram entry mode.
	When entering a Ladder diagram, using the arrow key pad lets the user move from one element to another using the **Z4** and **Z2** keys, and then change the value using the **Z1** and **Z3** keys.

In the remainder of this Chapter, these keys will be referred to as **Del.**, **Ins. Line**, **Sel./ OK**, **Esc.**,**Z1**, **Z2**, **Z3** and **Z4**.

3. Element Entry Method

Entering an element

It is only possible to position an element (contact or coil) when the blinking ■ cursor is displayed on screen.
Contacts are entered in the three left hand columns and coils can only be entered in the last column.

Entering a contact

1- Place the blinking ■ cursor in the required position.
2- Press **Sel./ OK**.
3- Choose the required contact type using keys **Z1** and **Z3**.
4- Use the **Z2** key to call-up the number.
5- Choose the number using keys **Z1** and **Z3**.
6- Press **Sel./ OK** or **Z2** to validate.

Entering a coil

1-Place the blinking ■ cursor in the required position.
2-Press **Sel./ OK**.
3-Choose the required coil type using keys **Z1** and **Z3**.
4-Use the **Z2** key to call-up the number.
5-Choose the number using keys **Z1** and **Z3**.
6- Use the **Z2** key to move to the coil function.
7-Choose the coil function using keys **Z1** and **Z3**.
8-Press **Sel./ OK** to validate.

Validating some function block coils will bring-up a function block parameter setting screen. For information on parameter characteristics and data entry methodology, refer to Chapter 4, page 40.

Changing an element

To change an element in an existing Ladder diagram, simply move to the element to be changed and follow the same procedure as when entering a new element.

Deleting an element

To delete an element, simply place the ■ cursor on the required element the press **Del**. Generally, the deleted element must be replaced by a link.

4. Link Entry Method

Entering links between elements

In most cases, links are automatically entered by the smart relay. However, to enter a link manually, proceed as follows.

Links can only be entered when the ● blinking cursor is displayed.

1- Place the ● blinking cursor at the desired location.
2- Press **Sel./ OK** to start the link (the "**+**" cursor).
3- Draw the link by moving the "**+**" cursor to the desired location using the **Z1**, **Z2**, **Z3** or **Z4** keys.
4- Press **Sel./ OK** to validate the link.

Repeat this action as many times as necessary to link the elements together as required.

Deleting links between elements

To delete a link, simply move the ● or ■ cursor onto the link to delete and press **Del**.

Replacing a link with a contact

To replace a link with a contact, simply place the ■ cursor at the required location and enter the contact as described on the previous page.

5. Function Block Parameter Entry Method

When entering a Ladder diagram, the function block parameters must be filled in. These parameter setting screens are displayed for:

Entering a Clock function block,
Entering an Analog function block,
Entering a command input to a Timer function block,
Entering a count input to a Counter function block.

Regardless which parameter setting screen is displayed, the parameter entry principle is the same:

1-Use the **Z2** and **Z4** keys to move the ■ blinking cursor onto the parameter to change.

2-Select the parameter by pressing **Sel./ OK**.

3-Change the parameter value using the **Z1**, **Z3 and Z2, Z4** keys.

4-Validate the value obtained by pressing **Sel./ OK**.

5-Finish data entry by pressing **Esc.** to return to Ladder diagram entry.

6. Deleting and Inserting Ladder Diagram Lines

Deleting a Ladder diagram line

Ladder diagram lines are deleted line by line. Proceed as follows.

1-Move the cursor to a blank space in the line (where there are no links or no element). If necessary, delete an element to create the necessary blank space.
2- Press **Del**.
3- A delete validation menu is displayed. Select the appropriate choice using the **Z1** and **Z3** keys.
4- Validate the choice by pressing **Sel./ OK**.

The line is deleted.

Note: **It is possible to delete all of the Ladder diagram lines stored in a smart relay. To do this, call up the "CLEAR PROG." option in the main menu and validate the deletion of all Ladder diagram lines.**

Inserting a Ladder diagram line

To insert a Ladder diagram line, simply move to the line immediately above the one to create and press **Ins. Line**.

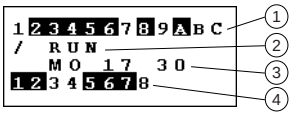
Chapter 6 - Contents
Debugging

This Chapter covers the following subjects:

Once an application has been entered in Ladder diagram form, debugging tests still remain to be run.

The first step is to set the smart relay to RUN. To do this, select the "**RUN/STOP**" option from the main menu and validate the RUN mode selection made.

From this moment on, the smart relay handles the physical inputs and outputs according to the instructions entered in the Ladder diagram.



1-Display input status (B and C represent analog inputs)
2-Display the operating mode (RUN/STOP)
3-Display a parameter, by default the day and time for products with a clock function (see example)
4-Display the output status

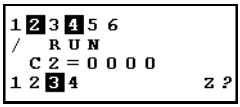
When inputs or outputs are activated, they appear in reverse video (using white on a black background).

This concept is referred to as the dynamic operation of smart relay functions. The terms RUN and dynamic have a similar meaning in the remainder of this publication.

Viewing a parameter on the main screen

Simply call up the "**VISU.**" menu and use the **Z1** and **Z3** keys to select the required parameter and confirm the selection using the **Sel./ OK** key. Pressing **Esc** twice returns you to the main screen.

Viewing the value of counter **C2**:

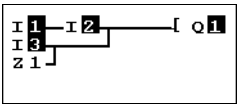


2. Dynamic Mode Ladder Diagrams

Displaying Ladder diagrams

The smart relay can dynamically display the performance of a Ladder diagram. To do so, simply call up the "**PROGRAM.**" option and select the lines to display using the cursor keys.

Each closed contact or energized coil is displayed in reverse video mode (using white on a black background).



To change smart relay performance, the user can change or display some of the function block parameters.

Changing Ladder diagrams

Note: **It is ABSOLUTELY IMPOSSIBLE to change Ladder diagram lines in RUN mode.**
It is however possible to change function block parameters.
In RUN mode, the Del. and Ins. Line keys are not available.
The Sel./ OK key is only usable for function blocks.

Using Z keys as pushbuttons

When the menus are called up, the Z can no longer be used as pushbuttons. To test the Ladder diagram in dynamic mode and observe the effect of the Z keys, the user must:

1 - Display the Ladder diagram (see below),
2 - Place the cursor on a "Z" key,
3 - Press the **Sel./OK** key.

To disable pushbutton mode operation, simply press the **Esc** key.

3. Dynamic Mode Function Block Parameters

Displaying function block parameters

In RUN mode, additional functions are available. It is therefore possible to display function block parameters.

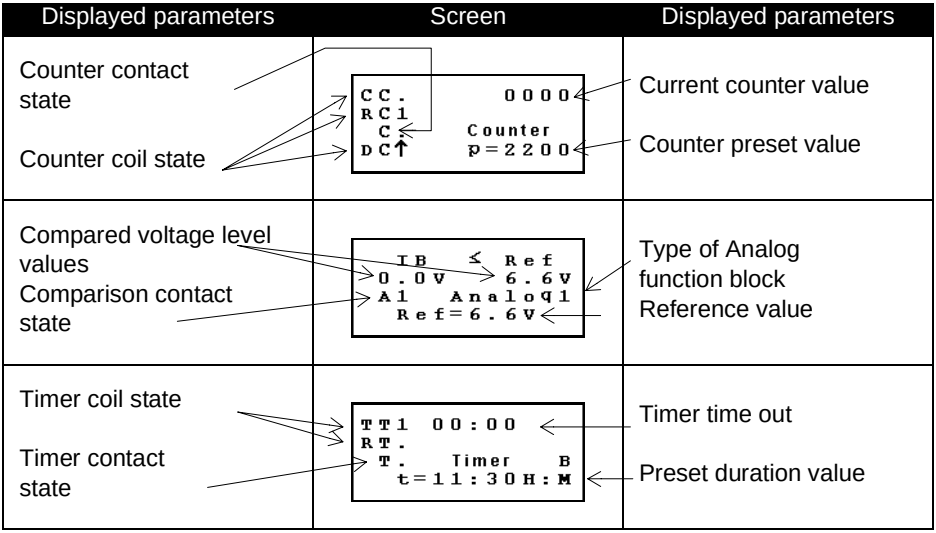
The following elements can be displayed:

1- The current and preset values of a Counter.
2- The status of Counter inputs and outputs.
3- The current and preset values of a Timer.
4- All of the parameters of a Clock function block.
5- The reference voltage for an Analog function block.
6- The hysteresis value for an Analog function block.
7- The values measured on the analog inputs.

To do this, simply call up the "**PROGRAM.**" option and select the required function block, then press **Sel./ OK**.

A new screen is called up showing the function block's parameters. The procedure is the same as the one used to change function block parameters.

Screen example:



3. Dynamic Mode Function Block Parameters

Changing function block parameters

In RUN mode a function block preset value can be changed dynamically if it is not locked.

The following actions are allowed:

1- Changing a Counter preset value.
2- Changing a Timer preset value.
3- Changing Clock function block parameters.
3- Changing the reference voltage for an Analog function block.
4- Changing the hysteresis value for an Analog function block.

To do this, the simplest way is to:
1- Select "**PARAMET.**" from the main menu.
2- Press **Sel./ OK**.
3- Choose the required parameter using the **Z1** and **Z3** keys.
4- Press **Sel./ OK**.
5- Modify the parameter value using the **Z1**, **Z3** and **Z2, Z4** keys.
6- Validate by pressing **Sel./ OK**.

It is also possible to change a parameter value by selecting the "**PROGRAM.**" function and then selecting the required function block by pressing **Sel./ OK**.

4. Dynamic Mode Menus

Some menus are accessible in RUN mode, while others are not. Here is a summary table.

Menu	Access in STOP mode	Access in RUN mode
TIME SET	Yes	Yes
PROGRAM.	Yes	Yes*
PARAMET.	Yes	Yes
VISU.	Yes	Yes
RUN/STOP	Yes	Yes
CONFIG.	Yes	Yes
CLEAR PROG.	Yes	No
TRANSFER.	Yes	Yes**
PROG. INFO or SOFT	Yes	Yes
Configuration menu		
PASSWORD	Yes	Yes
LANGUAGE	Yes	No
FILT.	Yes	No
Zx=KEYS	Yes	No
HELP	Yes	Yes
REMANENZ	Yes	No

* Dynamic program display in RUN mode, modification in STOP mode.

** Program transfer from the module to a PC in RUN mode, while all other transfers are done in STOP mode.

5. Smart Relay Reaction to a Power Break

A power break may cause the smart relay to restart and loose any data not saved.
Depending on their version level, smart relays have a battery back up lasting 72 or 150 hours. To ensure this endurance, the smart relay must have been powered up for approximately two hours.
The tables below show how the smart relays react depending on their version level (which can be read from the module label).

Smart relay version ≤ V1.6

Version ≤ V1.6			
Power break duration	< 1 ms (DC) <10 ms (AC)	< 72 hours	> 72 hours
Program	Saved	Saved	Saved
Parameters Counters (preset) Timers (preset) Clock (parameters)	Saved	Saved	Saved
Date and Time	Saved	Saved	**(see Note)**
Current values Current counter values Timer elapsed time value	Saved	Reset to zero on restart	
Coil states Auxiliary relays (**M**x) Set coils (**SQ**x) Two position coils (⎍**Q**x)	Saved	Reset to zero on restart	

Note: **Smart relays without clocks automatically restart in RUN mode after a power break, regardless of its duration.**

Smart relays with clocks restart in RUN mode as long as the current time is saved (for at least 72 hours). If the current time is lost, then the smart relay is set to STOP mode and displays the time setting screen.

5. Smart Relay Reaction to a Power Break

Smart relay version ≥ V1.7

Smart relays version levels V1.7 or higher have the ability to save the current time for at least 150 hours.
In addition, it is also possible to back up the variables defined in the **"REMANENZ"** menu.
Voir “6. Data Backup Function "REMANENZ"”, page 36.

Version ≥ V1.6			
Power break duration	< 1 ms (DC) <10 ms (AC)	**< 150 H**	**> 150 H**
Program	Saved	Saved	Saved
Parameters Counters (preset) Timers (preset) Clock (parameters)	Saved	Saved	Saved
Date and Time	Saved	Saved	**(see Note)**
Valeurs courantes Current counter values Timer elapsed time value	Saved	**Saved if defined in the "REMANENZ" menu**	
Coil states Auxiliary relays (**M**x) Set coils (**SQ**x) Two position coils (⌋⌈**Q**x)	Saved	**Saved if defined in the "REMANENZ" menu**	

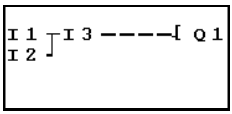
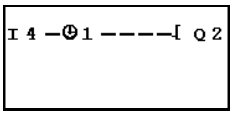
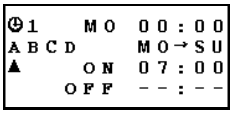
Note: **Smart relay versions ≥ V1.7 always restart in RUN mode (if the RUN mode was selected before the power break).**

When the current time setting is lost (after a power break exceeding 150 hours), the third line in the main screen blinks and the clock function blocs are not activated in the Ladder diagram.
Pressing "Sel./ OK" will display the screen used to update the date and time setting. Pressing "Esc" after updating the date and time will return you to the main screen.
Clock function blocks become active once again.

5. Smart Relay Reaction to a Power Break

Safety mode

If loosing the time setting is to lock coil control in smart relay versions ≥ V1.7, then simply use a clock contact without a stop order in series with the action coils.

Screen	Comments
	The contact line for coil Q1 will be active even if the time and date setting is lost.
	The contact line for coil Q2 will only be active after setting the clock.
	Parameter setting screen for clock function block 1.

Chapter 7 - Contents
Application Example

This Chapter covers the following subjects:

1. Specifications

The specification seeks to enhance and centralize the control system in the underground car park of an office building. The vehicle entrance and exit to and from the car park are controlled by a typical automatic barrier that handles the normal standard functions such as opening and closing time delays to allow vehicles to pass, processing payment tickets, a built-in security interphone, external barrier locking in the closed position...

In addition, the new specification calls for adding a function to count the number of vehicles parked in the car park and control a light up display informing users that all of the parking spaces are taken and stopping new entries by locking the barrier in the closed position. Drivers then know to look for a parking space elsewhere. It must also be possible to override this function when it is necessary to allow the emergency services to intervene (fire department, emergency medical service...).

The specification also calls for being able to inhibit access to the car park outside of working hours and to allow the security personnel to override this function for exceptional events. The normal working hours are: Monday to Friday from 08:30 to 17:30, Saturday, from 09:30 to 12:00 and complete closure on Sundays.

For safety reasons, it is also necessary to exhaust toxic emissions such as carbon dioxide using a fan when the concentration levels measured exceed permissible levels (using a dedicated sensor that provides an output value between 0 and 10V).

There is also a requirement to control lighting triggered by a vehicle arriving and through pushbutton switches placed near all of the pedestrian access points. For power saving reasons, the lighting will be switched off after a delay of 10 minutes, the length of time normally observed to be adequate for a user to park, leave their vehicle and take the elevator or return to their vehicle and leave the car park.

To complement this system, manual intervention should allow updating the number of vehicles in the car park by incrementing or decrementing the number of vehicles as determined by the smart relay.

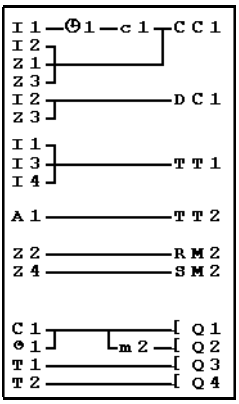
2. Specification Analysis

Smart relay label	Description
Input **I1**	Vehicle entry detection.
Input **I2**	Vehicle exit detection.
Counter **C1**	Counts the number of vehicles in the car park (93 maximum).
Output **Q1**	Indicates when the car park is full.
Output **Q2**	Locks the entry barrier (inhibits entry barrier opening) when the car park is full of outside of office hours.
Function key **Z4**	Manually releases the entrance barrier.
Function key **Z2**	Resumes automatic entry control.
Function key **Z1**	Manually increments the number of vehicles in the car park.
Function key **Z3**	Manually decrements the number of vehicles in the car park.
Clock function block No. 1	Manages car park access hours.
Inputs **I3** and **I4**	Pushbuttons at pedestrian access points used to light car park lighting. One for the elevator and one for the stairway (no pedestrian access is allowed via the vehicle entrance).
Output **Q3**	Control lighting.
Timer function block No. 1	Lighting timer (10 minutes).
Analog input **IB**	Carbon dioxide level sensor.
Analog function block **A1**, the authorized threshold value corresponds to 8.5 Volts.	Compairs the carbon dioxide level measured with the allowable threshold.
Output **Q4**	Controls the polluted air extraction fan control.
Timer function block No. 2	Fan timer (15 minutes).

Note: **To implement this solution, a smart relay with analog inputs, Clock function blocks and at least four discrete inputs and outputs. The ideal smart relay is an SR1 B 12 1 BD.**

3. Implementing the Solution

Implementing the Ladder diagram



Counting vehicles in, subtracting vehicles out and manually updating the number of vehicles actually in the car park.

Starting the lighting timer.

Starting the fan timer.

Handling the manual release function.

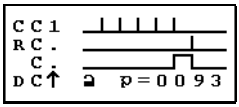
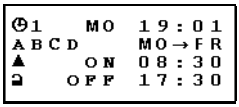
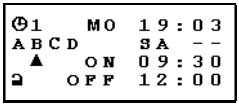
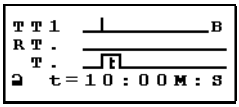
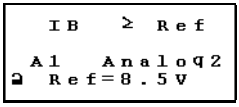
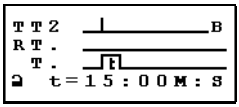
Controlling outputs: Car park full indicator, blocking the input, lighting the car park and running the extraction fan.

Note: **When upcounting and downcounting, the counter locks up when the car park becomes full (no spurious detection or counting actions take place if vehicles are allowed to enter in manual release mode). IMPORTANT: For a given counter, the CC and DC coils should only appear once in a Ladder diagram.**

In addition, output Q2 is triggered when entry into the car park is not allowed. This leads to the use of an auxiliary relay to manually lock or unlock the access barrier using the arrow keys.

3. Implementing the Solution

Setting function block parameters

Function block	Comments
Counter function block **C1** 	The preset value is 93 (the maximum number of vehicles allowed in this car park). Where necessary, this value can be changed during operation.
Clock function block **1**  	Opening hours: Monday to Friday from 08:30 to 17:30, Saturday from 09:30 to 12:00 and closed all day on Sunday. Two ranges are used.
Timer function block **T1** 	Car park lighting timer (10 minutes).
Analog function block **A1** 	Compares the measured carbon dioxide level with the threshold value (8.5 V).
Timer function block **T2** 	Fan operating duration if the carbon dioxide threshold is exceeded.

Chapter 8 - Contents
Troubleshooting

This Chapter covers the following subjects:

1. Smart Relay Messages

Explanation of the messages returned by the smart relay. These messages generally indicate incompatible actions requested by the user.

Message	Cause	Corrective action
ERR. RUN MODE	User requested access to a fuction that is only available when the smart relay is stopped.	Return to the main menu, select the "**RUN/STOP**" option, stop the smart relay, then return to where the message occurred.
NO PARAMET.	User requested access to the "**PARAMET.**" option when no parameter is available (the Ladder diagram does not include any elements with parameters).	Go to the Ladder diagram to check that it was correctly entered and that it comprises elements with parameter settings: Counters, Timers, Time/Date functions, Analog function blocks.
NO PARAMET.	The user requested access to the "**VISU.**" option when no element that can be displayed has been entered in the diagram.	Go to the Ladder diagram to check that it was correctly entered and that it comprises at least one function block.
PROGRAM. INCOMPAT.	The user requested the transfer of a program that does not match the characteristics of the target smart relay, e.g. different clocks, analog inputs, software version level).	Check the origin of the program to transfer and choose a program that is compatible with the appropriate smart relay.
TRANSF.ERR.	A transfer was in progress and the link with the PC went down unexpectedly.	Refer to the documentation for the smart relay PC programming application called **ZelioSoft**.
TRANSF.ERR.	A transfer to the EEPROM was requested and the EEPROM is not present or incorrectly located.	Check the presence and correct location of the EEPROM.
Outputs are displayed blinking on the main screen	One or more static outputs have shorted or overloaded.	Troubleshoot, then stop the smart relay to end the blinking before selecting RUN mode again (automatic reset).

1. Smart Relay Messages

Message	Cause	Corrective action
PROGRAM. ERR.	Internal smart relay problem.	- Clear the program - If the problem remains, swap the smart relay for a version level ≥ V1.6
RTC IC ERROR	The smart relay's internal clock component does not work correctly.	- Power down the smart relay - Power up the smart relay once again - If the problem remains, swap the smart relay

2. Frequently Asked Questions

To assist the user in understanding the smart relay, the table below details frequently asked questions.

Question	Answer
I cannot access some parameters.	Some parameters are not accessible, refer to the documentation to determine whether these elements can be changed. Example of an element that cannot be changed: Counter function block counting direction. This element is only accessible by wiring in a Ladder diagram line.
I still cannot access some parameters	To access the parameters, use the **Z4** and **Z2** keys on the arrow key pad to select them (the **Z1** and **Z3** keys are only used to change their value). Then press **Sel./ OK** to change the selected element using the **Z1** and **Z3** keys.
When I try to change a parameter, the **Z1** and **Z3** keys on the arrow key pad do not work.	This is normal. To enter the modification mode, first press the **Sel./ OK** key (the parameter blinks). Then the **Z1** and **Z2** keys become effective.
I cannot STOP my smart relay despite validating the RUN/ STOP option in the main menu using the **Sel./ OK** key.	BE SURE to correctly read the message text and confirm the correct option.
My Ladder diagram comprises 67 lines and it takes quite a long time to reach the last line. What can I do to speed things up?	To move around faster, simply press the **Z1** or **Z3** keys on the arrow key pad for a longer length of time. You can then scroll five lines at a time.
I would like to change my Ladder diagram lines but the **Sel./ OK** key no longer works.	Ensure that the smart relay is indeed stopped. Changing in RUN mode are not allowed.
When I try to change my Ladder diagram lines, the smart relay shows me a blank screen. Have I lost everything I did?	Not necessarily, this situation may occur if blank lines have been inserted at the start of the Ladder diagram. Press **Z3** to check whether your program lines are not located further down.

2. Frequently Asked Questions

Question	Answer
I have a Counter function block called **C1** used in a Ladder diagram line to count and it downcounts on another line. Only the downcount funciton works. Why?	This is perfectly normal, a Counter's **CC** coil must appear once and once only in the Ladder diagram. To understand the method, refer to the example in Chapter 7 page 81.
I have forgotten by password and I can no longer access my smart relay functions. What can I do?	To delete a password with the smart relay stopped, from the CONFIG menu, call up the password entry screen an simultaneously press **Z1**, **Z4**, **Z3**, **Z2**. To guarantee confidentiality, the program will be erased.
I have a Ladder diagram that uses a Z key as a pushbutton. I would like to test it but when I display the Ladder diagram in on-line mode, the Z key is no longer operational. What can I do?	To use the Z keys as pushbuttons when displaying a Ladder diagram in real-time mode, simply move the cursor onto a "Z" key and press **Sel.OK** when the Ladder diagram is displayed. To disable pushbutton mode, simply press **Esc**.
I generated a Ladder diagram on a module with a clock function. Can I use an EEPROM to transfer it to a smart relay without a clock?	No this is impossible. (Refer to the Transfer rules on page 92).
When entering a Ladder diagram, the Clock function blocks do not appear when choosing the contacts. Is this normal?	It is highly probable that the smart relay does not have a clock and that therefore the Clock function blocks cannot be accessed. Check the product reference numbers.
When entering a Ladder diagram, the Analog function blocks do not appear when choosing the contacts. Is this normal?	It is highly probable that the smart relay does not have analog inputs and that therefore Analog function blocks cannot be accessed. Check the product reference numbers.
It is not possible to draw a connection line to Contact zone 1 to set up a permanent command state.	To set up a permanent command state, you need to use an auxiliary relay coil **M**x or an **I**x input in normally closed state after ensuring tha this coil is not used elsewhere in the program.

Chapter 9 - Contents
Transferring Ladder Diagrams

This Chapter covers the following subjects:

1. How to Transfer an Application

Smart relay -> PC transfer

The Zelio smart relay can be configured and programmed using the ZelioSoft program. This transfer function lets the user retrieve an application from a smart relay using the program.

The following method is used:

1- Select the "**TRANSFER.**" function from the main menu.
2- Press the **Sel./ OK** key to validate.
3- Select the "**Modul.->PC**" function.
4- Press the **Sel./ OK** key to validate.
5- Enter the password if necessary.
6- The smart relay displays "**READY**" and the transfer is performed as soon as the program is ready.

PC -> Smart relay transfer

This transfer function is used to load an application developed using ZelioSoft into a smart relay.

The following method is used:

1- Select the "**TRANSFER.**" function from the main menu.
2- Press the **Sel./ OK** key to validate.
3- Select the "**PC->Modul.**" function.
4- Press the **Sel./ OK** key to validate.
5- When prompted to "**Change Prog?**" select the answer "**YES**" by pressing the **Z1** key.
6- Press the **Sel./ OK** key to validate.
7- The smart relay displays "**READY**" and the transfer is performed as soon as the software requests it.

Note: **The comments fields and and any notes entered in the ZelioSoft programming application are not transferred to the smart relay and will therefore be lost when a logic module is transferred to a PC.**

For smart relay versions ≥ V1.7, the ZelioSoft application automatically takes over and the transfer can take place without the need for any intervention on the smart relay.

1. How to Transfer an Application

Smart relay -> EEPROM transfer

The smart relay has an optional EEPROM. This function lets the user load the application from the Zelio smart relay into the EEPROM.

The following method is used:

1- Select the "**TRANSFER.**" function from the main menu.
2- Press the **Sel./ OK** key to validate.
3- Select the "**Modul.->Mem**" function.
4- Press the **Sel./ OK** key to validate.
5- Enter the password if necessary.
6- The smart relay displays "**Modul.** >>>" then "**TRANSFER OK**", the transfer is done.

Note: **The EEPROM can then be used to load an application into another smart relay.**

Note: **This function is not possible on a Blind module.**

EEPROM -> Smart relay transfer

This transfer is used to reload an application into a Zelio smart relay. It avoids the need to re-enter an existing application.

The following method is used:
1- Select the "**TRANSFER**" function from the main menu.
2- Press the **Sel./ OK** key to validate.
3- Select the "**Mem->Modul.**" function.
4- Press the **Sel./ OK** key to validate.
5- When prompted to "**Change Prog?**" select the answer "**YES**" by pressing the **Z1** key.
6- Press the **Sel./ OK** key to validate.
7- The smart relay displays ">>> **Modul.**" then "**TRANSFER OK**", the transfer is done.

Note: **The program in EEPROM must be compatible with the logic module.**

Transfer is only possible if:
- The receiving smart relay supports at least the same functions as the one used to create the program.
- The receiving smart relay's software version level at least equals that of the one used to create the program.

1. How to Transfer an Application

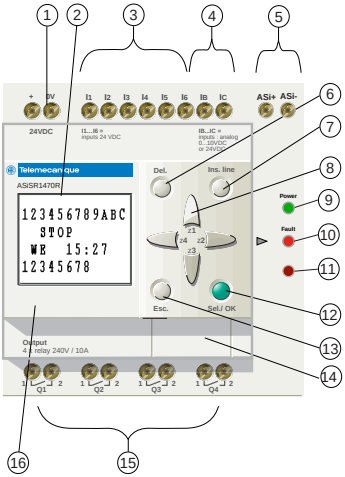
Note: **On Blind modules without clocks, the program on the EEPROM will automatically down load into the module providing no program exists in the module. On Blind modules with clocks, this function is not possible.**

Chapter 10 - Contents
Using the ASi Connection

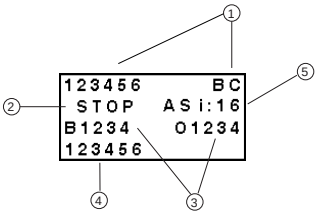
This Chapter covers the following subjects:

1. Presentation

Intended for use as peripherals in a more complex installation, the ASISR1470R and ASISR1470T smart relays allow direct connection to the ASi system.



1-Screw terminal block for 24 VDC supply
2-LCD, 4 lines, 12 characters
3-Screw terminal bloc for 24 VDC inputs
4-Screw terminal blocks for 0-10 Volt analog inputs that can be used in 24 VDC I/O mode
5-Screw terminal block for connection to the ASi line
6-Delete key
7-Insert line key
8-Arrow keys or after first configuring them, Z pushbuttons
9-Green LED confirming that the ASi line is powered up
10-Red ASI line failure LED
11-Infrared remote control for addressing by terminal
12-Selection and validation key
13-Escape key
14-Connector for backup memory or PC connection cable
15-Screw terminal block for relay outputs on ASISR1470**R** or for transistor outputs on ASISR1470**T**
16-Slot for re-writable label



1-Input status display (B and C represent the analog inputs)
2-Operating mode display (RUN/STOP)
3-Display showing ASi data, date and time or a parameter
4-Display showing the status of local outputs
5-Smart relay address (on condition that it was entered for display)

2. Characteristics and Connections

ASi relay characteristics

Supply	24 VDC (min. 19.2 V /max. 30 V)	
Reference numbers	ASISR1470R	ASISR1470T
Number of I/O	14	
Built-in ASi interface	7FE profile	
Weekly clock	YES	
Rated supply current	80 - 100 mA	
Nbr. of discrete inputs	6	
Rated voltage	24 V c	
Rated current	3 mA	
Nbr. of analog inputs 0-10V*	2	
Nbr. of outputs	6 relay outputs	6 transistor outputs
Switching voltage	5-150 Vc / 24-250 Va	24 Vc / 0.5 A
Max. switching current	5 A	0.5 A
AC 15 switching capacity	0.9 A / 230 Va	-
DC 13 switching capacity	0.6 A / 24 Vc	0.5 A / 24 Vc

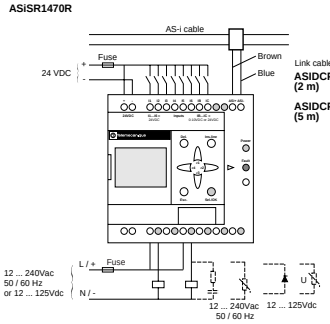
* Each analog input can also be used in 24 Vc discrete I/O mode.

2. Characteristics and Connections

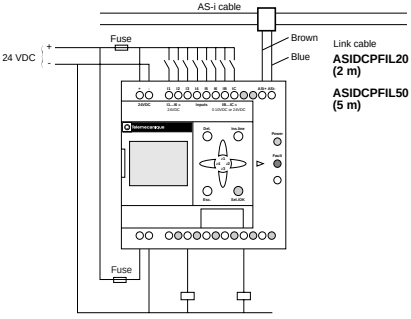
ASi relay connections

Discrete inputs and outputs - ASi line

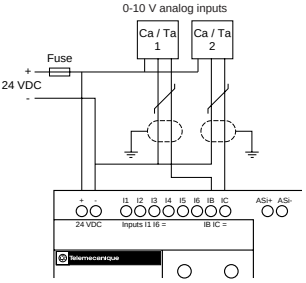
ASiSR1470R

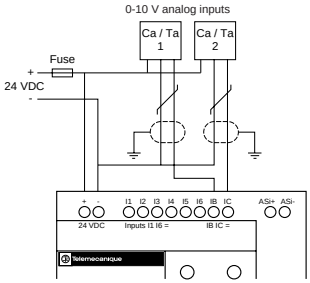


ASiSR1470T

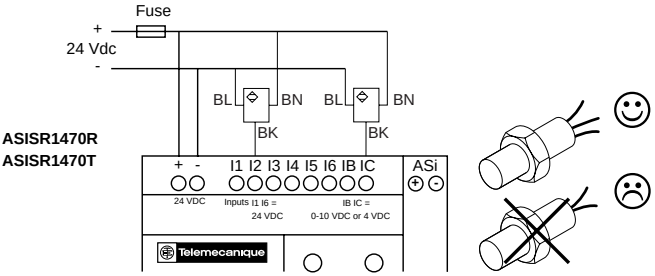


Analog inputs





Connecting 3-wire detectors



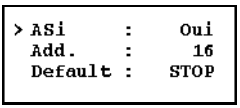
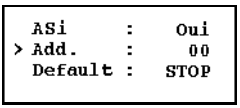
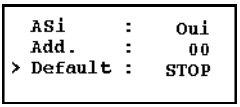
3. ASi Menu

Access

The ASi system configuration screen is accessed from the main menu. From the main menu, use **Sel. / OK** and **Z1** or **Z3** to access the ASi system menu.

Configuration

Configuring how the smart relay works on the ASi line comprises defining:

Display	Comments
Smart relay connection to the ASi system.  Default value: **Yes** = connected	This adjustment lets you use the ASi smart relay without any connection to the ASi line. The red Fault LED is disabled, the **B**x and **O**x coils are not available to the program, the ASi address does not appear on the main screen and **ASi I/O** display is not possible.
Smart relay address.  Default value: **00**	This address can be defined between 01 and 31. Important note: this action serves only to restate the address on the main screen (label function) and in no way represents the true addressing.
Smart relay reaction to an ASi line scan stoppage (fallback function).  Default value: **STOP**	You can choose to leave the smart relay in **RUN** mode or change it to **STOP.** If you choose **STOP**, then the smart relay stops as soon as it detects an ASi fault and the red Fault LED is lit. If you choose **RUN**, the smart relay continues to run, the **B**x contacts are read as 0, the **O**x coils continue to be calculated by the smart relay and the red Fault LED is lit.

3. ASi Menu

Addressing

Addressing can be performed:
- Using a terminal that may or may not be fitted with an infrared interface. This is recommended for a new installation.
- Automatically by the master. This mode is recommended for replacing or adding to an existing installation.

Situation	Recommended addressing mode	What do I do?
New installation: The smart relay's ASi+ and ASi- terminals are already connected to the ASi line (products are already wired to the machine).	Addressing "on the machine" using the ASITERV2 terminal fitted with its ASITERIR1 infra-red interface.	- Power up the smart relay's + and - (power supply) terminals. - Power up the ASi line **without connecting the master** or switch the master from "Run" to mode "Offline" mode leaving it connected to the line. - Connect the infra-red interface on the right hand side of the smart relay. - Use the addressing procedure provided with the ASITERV2 terminal. - Briefly cut the voltage on the ASi line before placing the master into service. - Copy the address to the smart relay for display puposes (see page 98, ASi Configuration).
New installation: The smart relay's ASi+ and ASi- terminals are already connected to the ASi line (products are already wired to the machine). **No infra-red interface available (XZMC11 terminal or ASITERV2 terminal without an infra-red interface).**	Addressing "on the machine" using a terminal fitted with an accessory for direct connection to the ASi line (XZCP1564L1 for example).	- Only connect **one unaddressed smart relay** (one that has a zero address) on the ASi line. - Power up the ASi line **without connecting the master** or switch the master from "Run" to mode "Offline" mode leaving it connected to the line. - Connect the ASITERV2 terminal to the line. - Use the addressing procedure provided with the ASITERV2 terminal. - Copy the address to the smart relay for display puposes (see page 98, ASi Configuration).
New installation: **The Zelio smart relay is not yet wired.**	Addressin "by table" using an ASITERV2 or XZMC11 terminal and an accessory for direct connecton to the line (XZCP1564L1 for example).	- Connect the terminal to the ASi+ and ASi- terminals on the smart relay. - Use the addressing procedure provided with the terminal. - Copy the address to the smart relay for display puposes (see page 98, ASi Configuration). Note: there is no need to supply the + and - terminals on the smart relay.
Exchanged for an existing smart relay.	Automatic addressing by the master.	- Refer to the documentation on the master. - Copy the address to the smart relay for display puposes (see page 98, ASi Configuration).

4. ASi Objects Accessible from the Master

ASi data bits

The built-in ASi interface allows, in addition to handling the smart relay's local I/O, receiving commands from a master ASi and returning states to it.

Display	Function	No.	Description
ONo.	Normally open	1 to 4	Status information for the ASi master. This can be used in the smart relay program like Q outputs, as coils or contacts.
oNo.	Normally closed		
BNo.	Normally open	1 to 4	Commands from the ASi master. These can be used in the smart relay program as I input contacts.
bNo.	Normally closed		

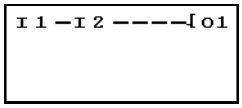
When a Schneider PLC is used as the ASi master the following correspondence will apply:

Smart relay address bits	ASi master bit address
O1	%I \ rack module.0 \ x.0
O2	%I \ rack module.0 \ x.1
O3	%I \ rack module.0 \ x.2
O4	%I \ rack module.0 \ x.3
B1	%Q \ rack module.0 \ x.0
B2	%Q \ rack module.0 \ x.1
B3	%Q \ rack module.0 \ x.2
B4	%Q \ rack module.0 \ x.3

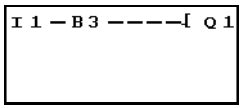
Where "rack module" = is the location of the master module in the PLC.
Where "x" = smart relay address on the ASi line.

5. Usage and Configuration Examples

Exemple 1: The ASi module in the master is located in slot 2 in rack 0. The smart relay's ASi address is 12.

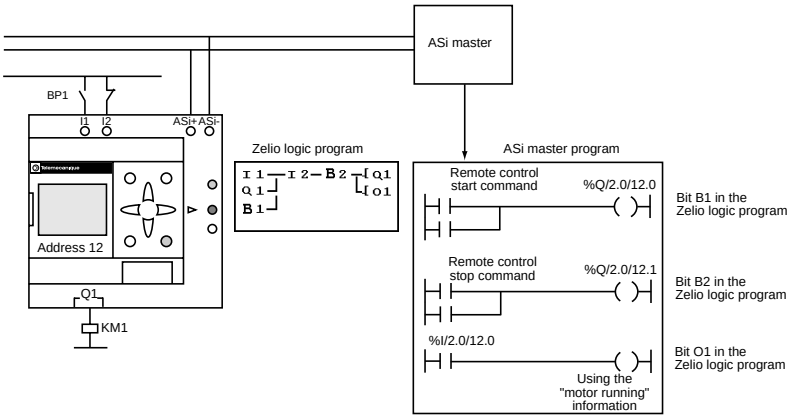
Smart relay program	Comments
	When smart relay inputs I1 and I2 are active, coil O1 and bit %I\2.0\12.0 in the master will be set to 1.

Exemple 2: The ASi module in the master is located in slot 2 in rack 0. The smart relay's ASi address is 12..

Smart relay program	Comments
	When smart relay input I1 is active and bit %Q\2.0\12.2 in the ASi master is set to 1, smart relay output Q1 will be active.

Example 3: Setting up a simple motor start system.

A local Start-Stop command using pushbuttons BP1 and AR, inputs I1 and I2.
A remote control from the master via the ASi system, bits B1 and B2 "Motor running" information returned to the master, bit 01.



6. Debugging - Troubleshooting

ASi indicator lights

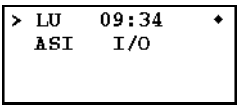
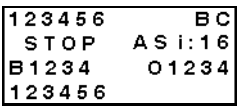
The built-in ASi interface comprises two indicator lights that are used for troubleshooting the ASi link.

Indicator lights	State	Description
Power	●	ASi system powered up. Important note: The Zelio smart relay is not supplied by the ASi line. Its power supply inputs must be connected to a 24 Vdc power supply.
	○	The ASi line is powered down. The module remains in RUN or changes to STOP depending on its configuration.
Fault	●	The ASi system has an error condition.
	○	The ASi system is operating correctly.
	☼	**Fault detected:** Zelio smart relay not supplied. Error in the program. Time not set. Transistor output has failed.

Displaying contacts and coils

The main screen can be configured to display the values of the **B**x contacts and **O**x coils.

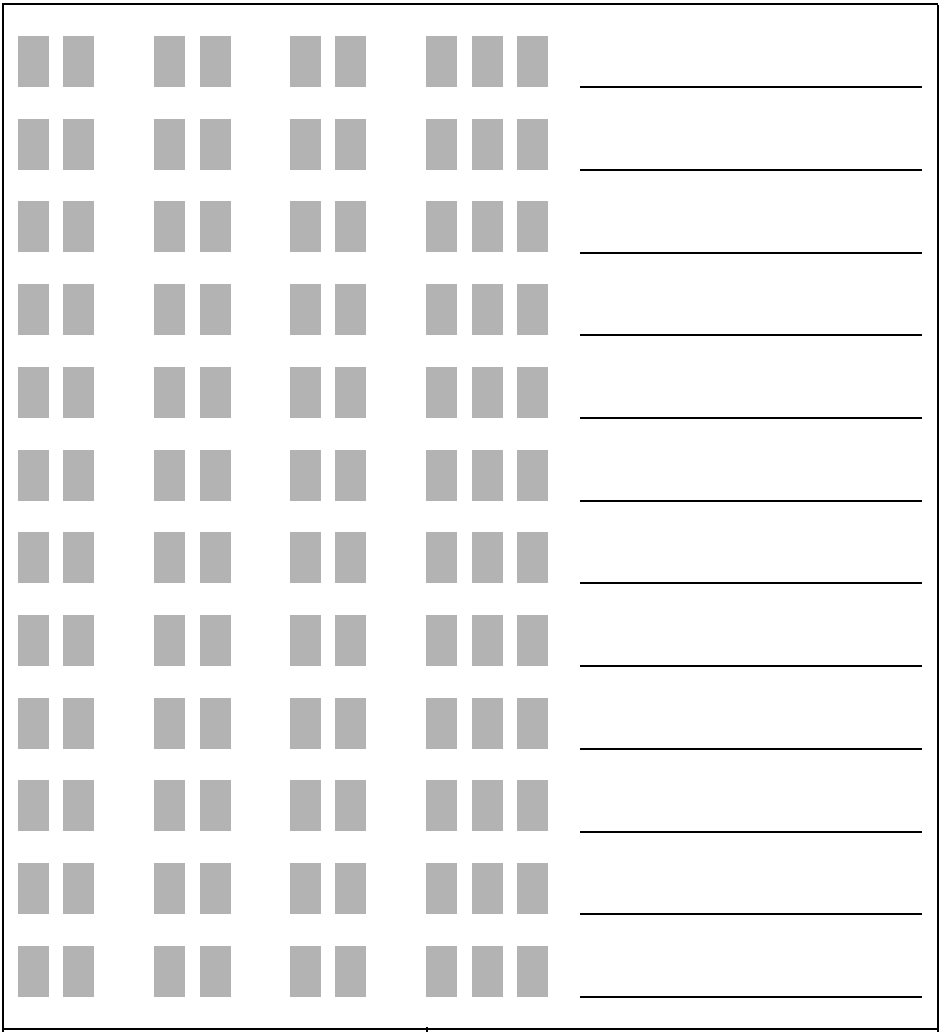
From the main menu, call up the "VISU" menu.

Smart relay program	Comments
	By default, the time and the date are displayed on the smart relay's main screen. Using the Z1 and Z3 keys, select the ASi I/O line. Use Sel./OK to validate.
	Use Esc to return to the main screen display to view the values of the ASi contacts and coils.

Appendix - Contents

This Chapter covers the following subjects:

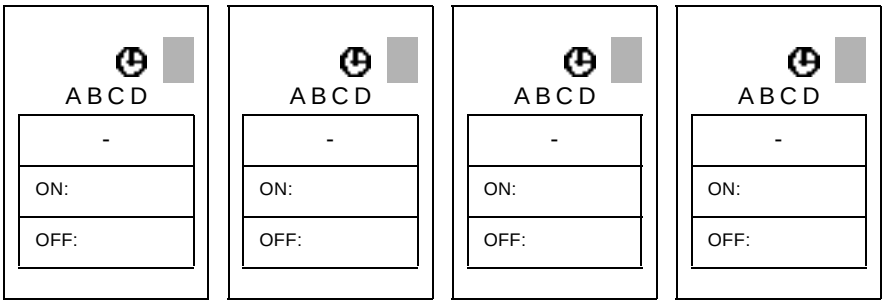
1. Forms



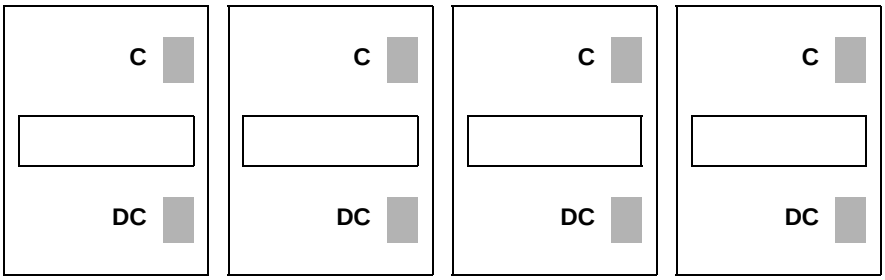
LADDER DIAGRAM	Application: _____
Schneider Electric	Date: _____ Version: _____
	Comments: _____
	_____
	_____
	Title page: _____

1. Forms

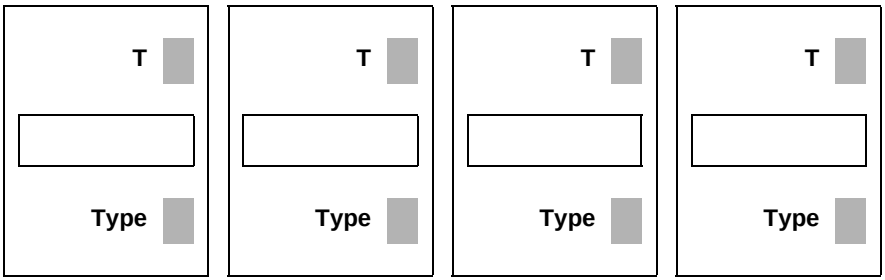
Clock function block



Counter function block

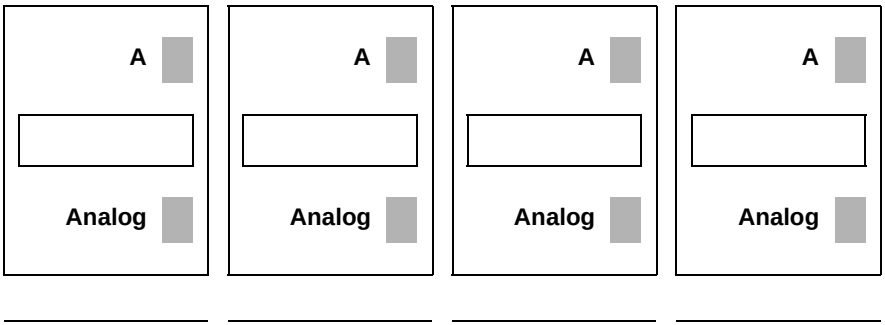


Timer function block

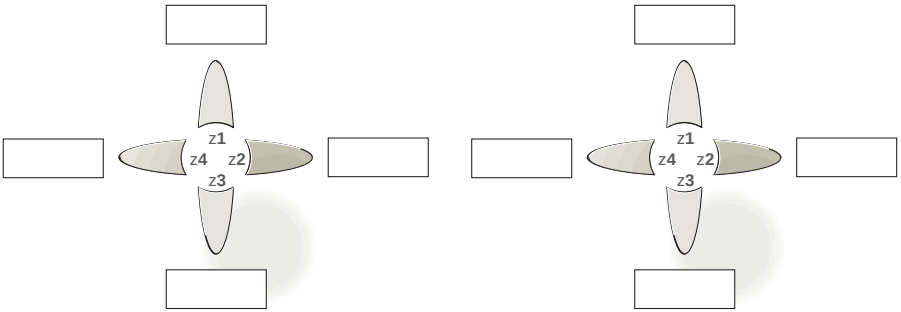


1. Forms

Analog function block



Arrow keys



User's quick reference

Reminder - Parameter display

To display parameters, press **Sel./ OK** to bring up the "**PARAMET.**" menu, then scroll the parameters using the **Z1** and **Z3** keys.

Reminder - Changing parameters

To change the parameters, simply move to the required parameter in the "**PARAMET.**" menu, press **Sel./ OK**, then change the parameter.

Reminder - Using the display screen

To monitor the state of an element on the main screen in real-time: bring up the "**VISU.**" menu, move to the element to display, then validate the selection by pressing **Sel./ OK**. Return to the main screen by pressing **Esc.**

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