SMART **PROGRAMMABLE RELAYS**

SERIES 900
INSTRUCTION MANUAL

c3controls®

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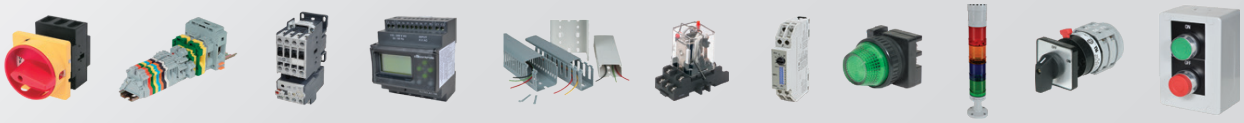


INTRODUCTION

THE C3CONTROLS **SERIES 900 SMART PROGRAMMABLE RELAY** PROVIDES THE RIGHT SOLUTION FOR ALL YOUR CONTROL NEEDS!

Providing excellent performance and functionality, the Series 900 relay performs simple logic, timing, counting, and real time clock operations. It is an ideal programmable controller designed for use in small commercial and industrial automation sectors, including packaging machines, printing machines, commercial building controls, parking controls, lighting applications, and more, where cost is a primary design issue. All programming and data adjustments can be done via the on-board keypad and display or with the help of the software.

Programming the Series 900 relay with the SPR-soft III software is quite simple, even without particular programming knowledge. It facilitates program generation, project simulation, and documentation which are accomplished simply by using the pick and place functionality, allowing maximum ease of operation.

BASE MODULE

EXPANSION MODULE

COMMUNICATION MODULE

FEATURES

- Integrated, ready to use, wide range of programmable functions including 16 timers, 16 (retentive selectable) counters, 16 time switches, 16 compare counters, 16 soft text messages, 64 auxiliary relays and 12 analog comparators.
- 8 digital inputs & 4 relay outputs. Two analog inputs (0-10V) in 12-24V DC, model which can be used as digital inputs.
- Ability to add up to three (3) expansion modules expanding I/O's to 32 digital inputs, 16 relay outputs.
- Communication module allows programmable relay to be connected to a Modbus network through RS 485 link.
- Backlit LCD screen for display and modification of pre-selected parameters of function blocks, viewing I/O status and programming on the device.
- Ladder programming using software on PC as well as on the device with the help of keypad & LCD display.
- Memory back up allowing programs to be transferred or copied into another Series 900 relay with the help of a memory card.
- Compact size 72mm (2-53/64") wide x 90mm (3-35/64") high x 65mm (2-9/16") deep, reducing panel area requirements for lower installed costs.
- Soft keys for convenient creation and editing of programs on the device.
- Available in both: AC (110-240V AC) & DC (12-24V DC) models.
- Password & Parameter lock facility.

EXPANSION MODULE

- Can be used with base module to increase I/O capacity of the Series 900 relay.
- 8 digital inputs & 4 digital outputs.
- Connections are made in Daisy chain fashion.
- The Series 900 relay can be expanded by connecting 3 expansion modules, to obtain a maximum configuration of 32 inputs and 16 outputs.

COMMUNICATION MODULE

- Provides Modbus communication through an RS 485 link.
- Possible to connect multiple Series 900 relays with a SCADA system or an HMI over RS 485.
- Available in both AC (110-240V AC) & DC (12-24V DC) models.
- The connection between the communication module and Series 900 relay base module is made through the communication module's cable (included).

APPROVALS

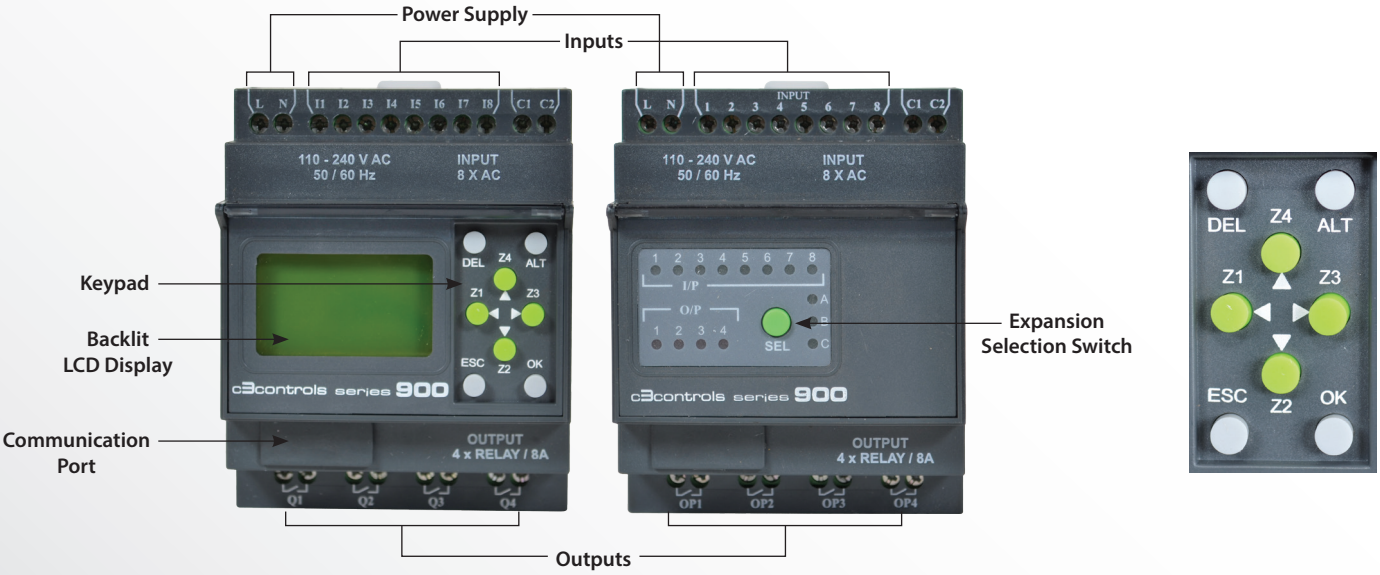
ACCESSORIES

USB CABLE

SERIAL CABLE

MEMORY CARD

KNOWING THE PRODUCT



FRONT VIEW OF KEYPAD & FUNCTIONS OF KEYS

The 8 keys located on the front facia of the Series 900 relay are used to configure, program, and control the application. ***They perform the following actions:***

DEL

This key is used to delete a program element or a blank line, if the cursor is located at the extreme column.

ALT

This key is used for selecting/exiting a parameter in the edit mode and to show either the parameters or program while the program is running. This feature is also useful for debugging.

OK

This key is used to insert a program line, when the cursor is blinking in the first column of the first row. During the parameter entry while editing this key saves the changes and proceeds to next parameter. In RUN mode, this key can be used to select one of the three displays. This also selects/deselects links.

ESC

This key is used to exit the menu or a selection. During the parameter entry it proceeds to the next parameter without saving the changes.

ARROW

On the program editor screen, the arrow keys are used to move up, left, down and right. The position on screen is shown by a cursor or blinking text.

AUXILIARY or Z-KEYS

Arrow keys are called auxiliary keys in RUN mode. They are used as push buttons to get signals from the user. If the user goes in PAR (parameter) mode, then these keys are not available as Z-keys. At that time these keys are used as arrow keys.

WIRING DIAGRAMS

POWER SUPPLY WIRING

1. Although the Series 900 relay has been designed to withstand the negative effects of any electrical noise that might be present in the incoming power supply it may be necessary to insert an isolation transformer between the supply and the line terminals of the Series 900 relay.
2. While using the DC Series 900 relay, run the 24V DC input line away from any AC supply lines.

WIRING OF INPUT/OUTPUT

1. Separate the input and output lines.
2. When the output lines are positioned close to power supply lines or the input lines shielding and separate grounding may be required.

SUPPLY, INPUT, & OUTPUT CONNECTIONS

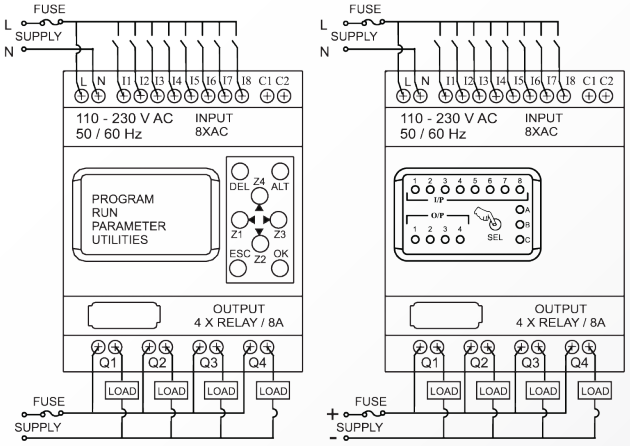


FIG. 1

AC Base Module AC Expansion Module

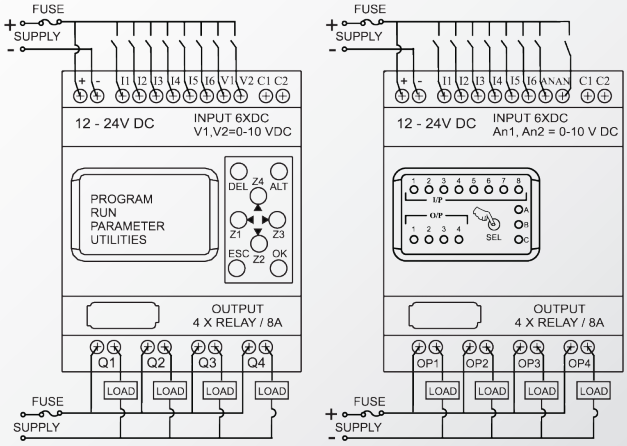


FIG. 2

DC Base Module DC Expansion Module

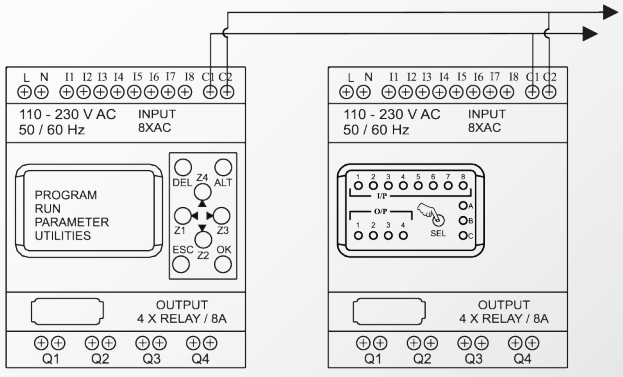


FIG. 3

AC & DC CONNECTION BETWEEN
BASE MODULE & EXPANSION MODULE

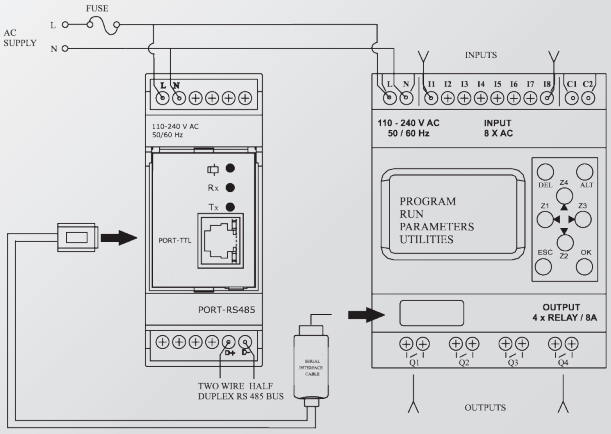
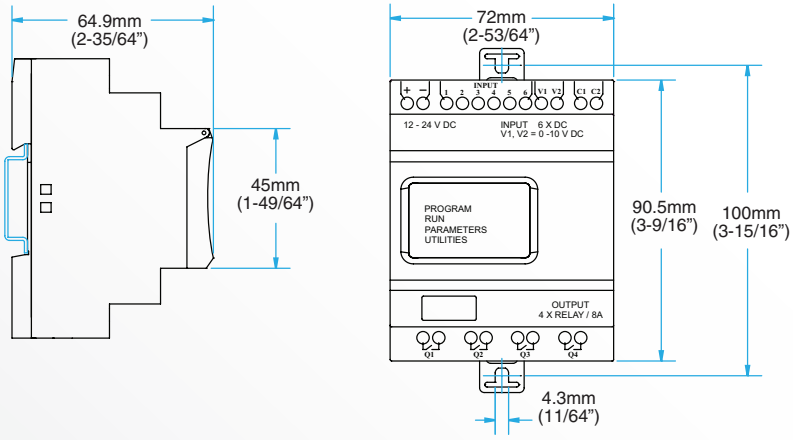


FIG. 4

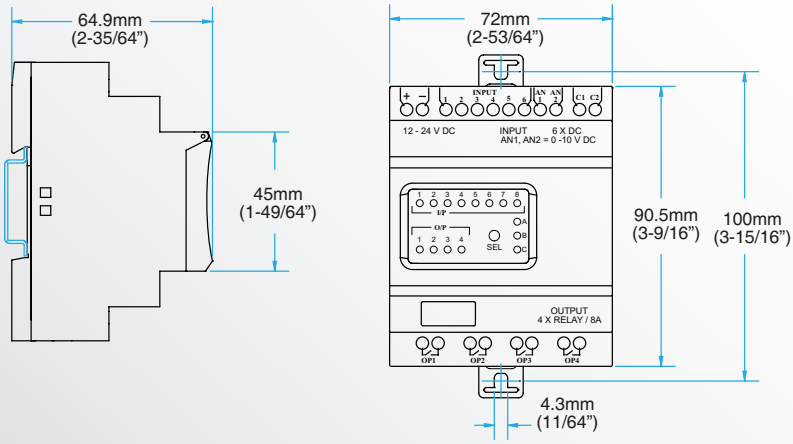
AC & DC CONNECTION BETWEEN
BASE MODULE & COMMUNICATION MODULE

MOUNTING DIMENSIONS

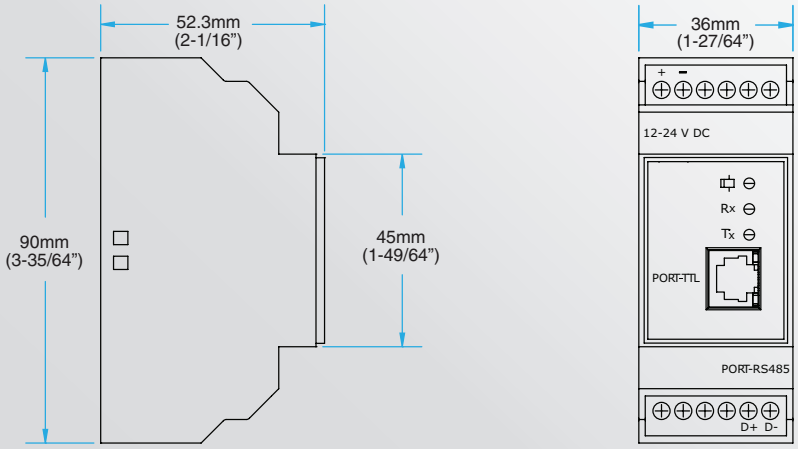
SMART PROGRAMMABLE RELAY BASE MODULE



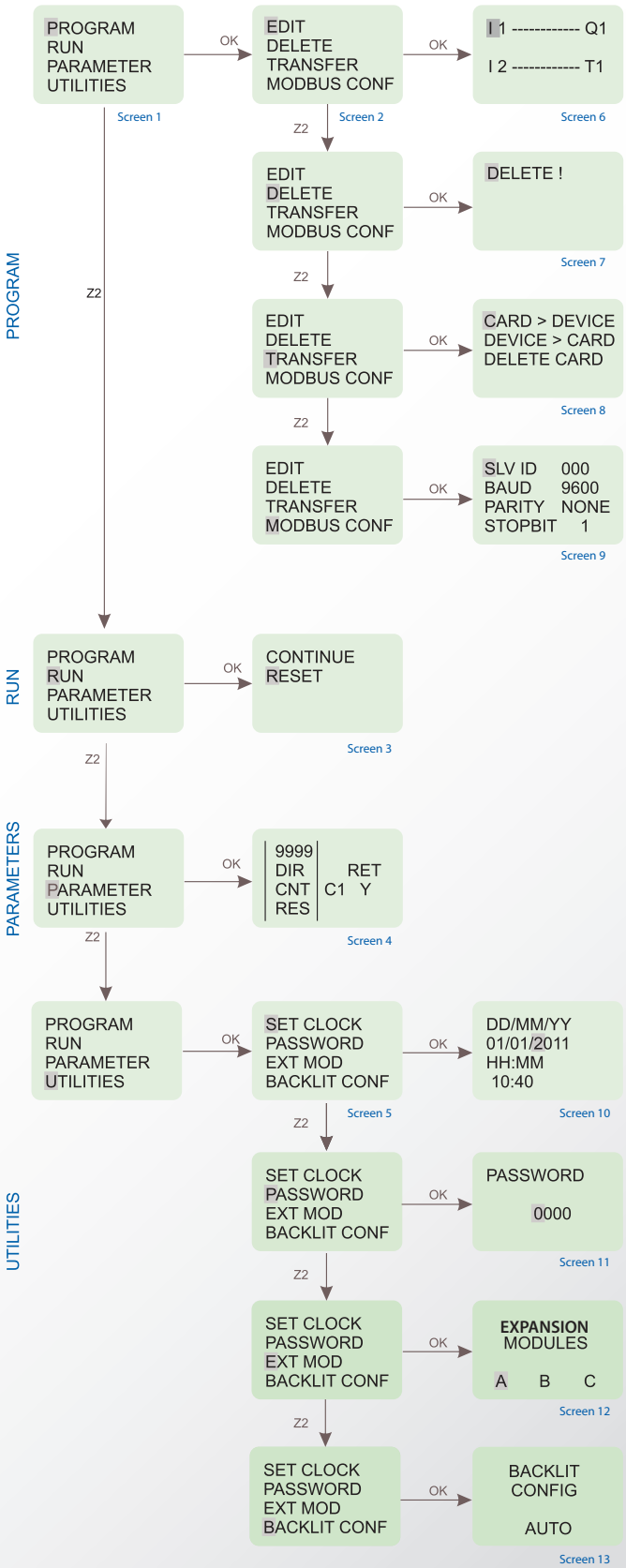
SMART PROGRAMMABLE RELAY EXPANSION MODULE



SMART PROGRAMMABLE RELAY COMMUNICATION MODULE



PROGRAMMING AT THE DEVICE: MENU & FUNCTIONS



Programming and other settings in the Series 900 relay can be done using the software as well as on the device itself with the help of the backlit display and keypad.

When the connections are made and the device is powered ON, screen 1 is displayed on the device. By default the cursor will blink on the 'PROGRAM' option. Using the Up/ Down keys, user can select between any of the options.

When the cursor is on the PROGRAM option and OK key is pressed, then screen 2 is displayed.

When screen 2 is being displayed, the cursor is on the 'EDIT' option.
Press the OK key to enter this option and screen 6 will be displayed. Similarly by pressing the Down key and OK, one can enter the other functions: "DELETE", "TRANSFER", "MODBUS CONF", and screens 7, 8, and 9 will be displayed respectively.

EDIT
This function allows the user to enter a new program or edit an existing program. If password is set, then this function is accessible only with the correct password.

DELETE
This function will clear the entire program stored in the Series 900 relay. If password is set, then this function will work only with correct password.

TRANSFER
This function will transfer the program from device to memory card or vice versa. Program data on memory can also be deleted in this mode.

MODBUS CONF
This function will set Modbus Slave configuration data.
The user can set the following communication parameters:
• SLAVE ID, BAUD RATE, PARITY, STOP BIT

When screen 1 is being displayed, press the Down key to shift the cursor to the RUN option and press the OK key to enter it. Screen 3 will be displayed.

RESET
The RESET mode resets all the previous states of inputs/outputs, clears timer and counter states, and starts afresh.

CONTINUE
The CONTINUE mode does not change the states of the inputs/outputs and special functions and continues with the execution of the program.

When the cursor is on the PARAMETERS option and OK is pressed then screen 4 will be displayed.

PARAMETERS
This function displays and allows the user to change parameters of special functions like timer, counter, time switch (clock), compare counters and analog functions used in the program. This may be password protected and may have additional individual lock for each parameter.

When the cursor is on the UTILITIES option and OK key is pressed, then screen 5 is displayed.

When screen 5 is being displayed, the cursor is on the 'SET CLOCK' option.
Press the OK key to enter this option and screen 10 will be displayed. Similarly by pressing the Down key and OK, one can enter the other functions: "PASSWORD", "EXT MOD", "BACKLIT CONF", and screens 11, 12, and 13 will be displayed respectively.

SET CLOCK
This function is used to set the day and time: Day of the week, Date, Hours-Minutes. This function is available only on the Series 900 relay unit.

PASSWORD
This function allows setting of password. If password is set, certain functions like Program and Parameters are protected and are accessible only when correct password is entered. The Password can be set or removed; the status is indicated by the open or closed lock symbol.

EXPANSION MODULE (EXT MOD)
This function allows the selection of the Expansion Modules (A/B/C). Maximum of three (3) Expansion Modules can be connected to the Series 900 relay main unit. In the SPR-soft III on PC, expansion modules have to be chosen using the "Configuration" menu.

BACKLIT CONF
This function allows the setting of backlight in either ON, OFF, or AUTO mode. In the AUTO mode, the backlight comes up only when a key is pressed on the device and remains for 10 seconds. If the ON or OFF modes are selected the backlight will be permanently ON or OFF respectively.

LADDER PROGRAMMING: ELEMENTS & FUNCTION BLOCKS

In ladder programming, the ladder elements and functional blocks are connected to create the logic needed for any application. The following section gives the description of each element that is used in SPR-soft III ladder programming.

INPUTS

The Series 900 relay provides two types of inputs: digital and analog
AC Model: Digital Inputs (1 - 8)
DC Model: Digital Inputs (1 - 6), Analog Inputs (V1, V2)

I1, I2, ... I8	Normally Open (NO) Contact	Base Module
J1, J2, ... J8		Expansion Module 1
K1, K2, ... K8		Expansion Module 2
L1, L2, ... L8		Expansion Module 2

i1, i2, ... i8	Normally Closed (NC) Contact	Base Module
j1, j2, ... j8		Expansion Module 1
k1, k2, ... k8		Expansion Module 2
l1, l2, ... l8		Expansion Module 2

OUTPUTS

The Series 900 relay provides digital outputs: Base Module (4), Expansion Module (4). The outputs can be configured as:
i. State Change (Contactor), ii. Level Change (Remote Control), iii. Bi-stable (Set Reset)

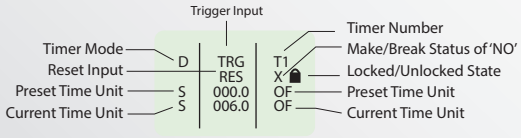
Q1, Q2, ... Q4	Normally Open (NO) Contact	Base Module
U1, U2, ... U4		Expansion Module 1
V1, V2, ... V4		Expansion Module 2
W1, W2, ... W4		Expansion Module 2

q1, q2, ... q4	Normally Closed (NC) Contact	Base Module
u1, u2, ... u4		Expansion Module 1
v1, v2, ... v4		Expansion Module 2
w1, w2, ... w4		Expansion Module 2

TIMERS

The Series 900 relay provides 16 timers which can be configured as:
i. ON Delay, ii. OFF Delay, iii. Single Shot, iv. Cyclic ON/OFF, v. Cyclic OFF/ON, vi. Make Interval, vii. Break Interval, viii. Delayed Make Interval, ix. Make/Break Interval OFF/ON, x. Make/Break Interval ON/OFF

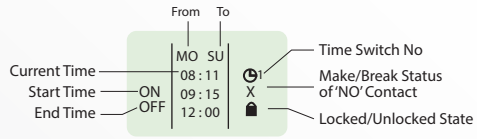
T1, T2, ... T16	Timer Coil/Normally Open (NO) Contact
t1, t2, ... t16	Normally Closed (NC) Contact



TIME SWITCHES

The Series 900 relay provides 16 time switches which can be used for daily or weekly applications.

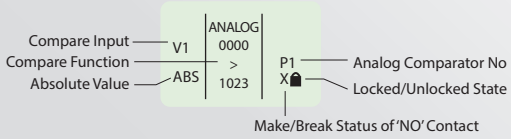
1, 2, ...16	Normally Open (NO) Contact
1, 2, ...16	Normally Closed (NC) Contact



ANALOG COMPARATORS

The Series 900 relay provides 12 analog comparators which can be used for comparison between values of two analog signals or between an analog signal and any absolute value.

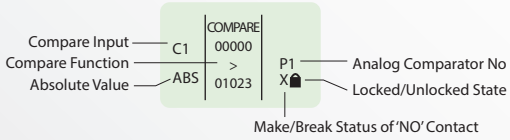
A1, A2, ... A12	Normally Open (NO) Contact
a1, a2, ... a12	Normally Closed (NC) Contact



COMPARE COUNTERS

The Series 900 relay provides 16 compare counters which can be used for comparison between values of two counters or between a counter and any absolute value.
i. Up Counter, ii. Down Counter

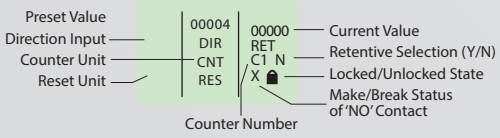
P1, P2, ... P16	Normally Open (NO) Contact
p1, p2, ... p16	Normally Closed (NC) Contact



COUNTERS

The Series 900 relay provides 16 counters which can be configured as:
i. Up Counter, ii. Down Counter

C1, C2, ... C16	Counter Coil/Normally Open (NO) Contact
c1, c2, ... c16	Normally Closed (NC) Contact



AUXILIARY RELAYS

The Series 900 relay provides 64 auxiliary relays which can be used to expand a rung from one line to another line. It can be configured as:
i. State Change (Contactor), ii. Level Change (Remote Control), iii. Bi-Stable (Set Reset)

M1, M2, ... M64	Auxiliary Coil/Normally Open (NO) Contact
m1, m2, ... m64	Normally Closed (NC) Contact

SOFT TEXT MESSAGES

The Series 900 relay provides 16 soft text message blocks which can be used to display text messages, the preset value and current value of any special function block or the current date and time.

X1, X2, ... X16	Used for viewing Alarms, HMI Functionality

Z-KEYS

Z-Keys are soft keys located on the front of the device. They behave exactly like the physical inputs (discrete inputs). The only difference is that they do not correspond to smart relay connection terminals, but to the four gray buttons on the front panel.

Z1, Z2, ... Z4	Normally Open (NO) Contact
z1, z2, ... z4	Normally Closed (NC) Contact

Z-Keys can be used as navigation keys for current displayed menu.
To access the Z-Keys while the program is running, press the ALT key, then press Z1 - Z4.

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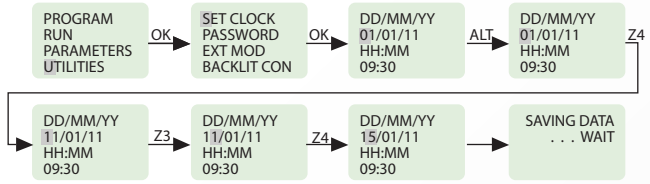
FUNCTIONS

SETTING THE CLOCK

1. Select the "UTILITIES" option from the main menu and press OK.
2. Select the "SET CLOCK" option from the sub menu and press OK.
3. The cursor will blink on the first digit of the date, press ALT to edit the digit.
4. The digit will now start blinking.
5. Using Up (Z4) and Down (Z2) keys select the appropriate digit.
6. Now press Z3 to edit the other digit and using Up and Down keys select the digit.
7. Now press OK to confirm the changes that have been made.
8. Repeat the same procedure to set the month, year, hour and minutes.
9. Once all the parameters have been set, press OK to save the changes and exit.

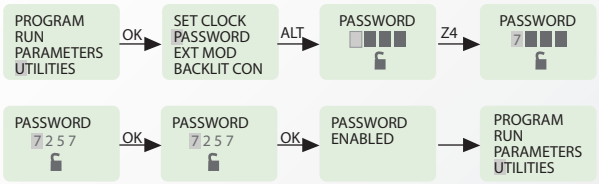


PASSWORD

The password secures access to the following main menu options: "PROGRAM", "PARAMETERS", and "UTILITIES".
In RUN mode password protects the run time parameters and ladder viewing. The password comprises four numeric digits from 0 to 9. Therefore the password can have any value between 0 and 9999.

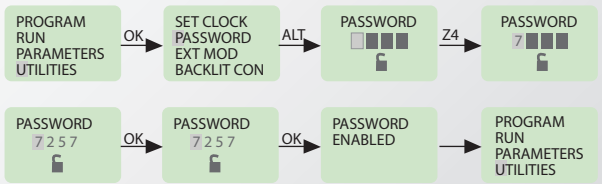
SETTING THE PASSWORD

1. Select the "UTILITIES" option from the main menu and press OK.
2. Select the "PASSWORD" option from the sub menu and press OK.
3. The unlock symbol means that the password is not yet set.
4. The cursor will blink on the first digit of the date, press the ALT key to edit the digit.
5. The digit will now start blinking.
6. Using Up (Z4) and Down (Z2) keys select the appropriate digit.
7. Now press Z3 to edit the other digit and using the Up and Down keys select the digit.
8. Press OK to confirm the password.
9. Press OK again to enable the password and return to the main menu.



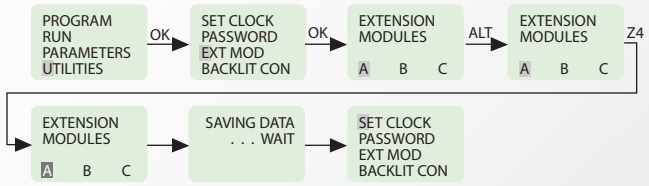
REMOVING THE PASSWORD

1. Select the "UTILITIES" option from the main menu and press OK.
2. Select the "PASSWORD" option from the sub menu and press OK.
3. The lock symbol means that the password is set.
4. The cursor will blink on the first digit, press ALT to edit the digit.
5. The digit will now start blinking.
6. Using Up (Z4) and Down (Z2) keys select the appropriate digit.
7. Now press Z3 to edit the other digit and using Up and Down keys select the digit.
8. Repeat the same procedure to set all 4 digits.
9. Now press OK to confirm the changes that have been made.
10. Pressing OK again, the password is disabled and the main menu is displayed.



EXPANSION MODULE SELECTION

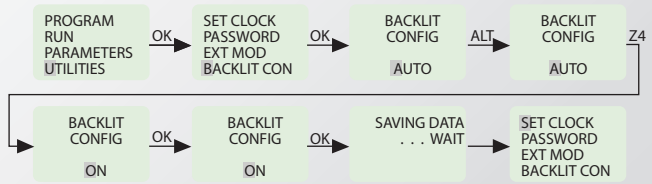
1. Select the "UTILITIES" option from the main menu and press OK.
2. Select the "EXT MOD" option from the sub menu and press OK.
3. The cursor will be blinking on 'A', press ALT to edit and the 'A' will start blinking.
4. Press Up (Z4) or Down (Z2) keys to select or deselect the expansion module.
5. A dark square around 'A' indicates that the module has been selected.
6. Now press OK to confirm the changes that have been made.
7. Repeat the same procedure if the other modules are to be selected.
8. Press OK to save the changes and the 'UTILITIES' sub menu is displayed.



If only one expansion (extension) module is being used and it has been assigned as 'A' on the expansion module using the selection switch then make sure that 'A' is selected in the 'EXT MOD' option in the 'UTILITIES' menu. If more than one expansion module is being used then make sure that the modules have been assigned and selected appropriately because this in turn will affect the inputs and the outputs.

BACKLIT CONFIGURATION

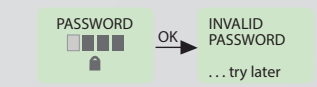
1. Select the "UTILITIES" option from the main menu and press OK.
2. Select the "BACKLIT CONFIG" option from the sub menu and press OK.
3. The 'AUTO' option will be displayed with the cursor blinking on it.
4. Press ALT to edit and the AUTO option will start blinking.
5. Press Up (Z4) or Down (Z2) keys to select other options: ON, OFF.
6. Now press OK to confirm the changes that have been made.
7. Press OK to save the changes and the 'UTILITIES' sub menu is displayed.



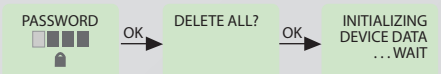
AUTO: In AUTO mode, whenever a key is pressed the backlight will be switched ON and will switch OFF after 10 seconds.
ON: In ON mode, the backlit will be permanently switched ON.
OFF: In OFF mode, the backlit will be permanently switched OFF.

PROGRAM PROTECTION

1. If the password is already enabled and user attempts to gain access using wrong password, then an error message is displayed.
2. If four such consecutive attempts are made then user is presented with options to either delete the entire device data or else revert.
3. If the DELETE ALL option is selected, then all device data including Password and program are erased. The user can then reprogram using SPR Soft software and secure it with a new password.



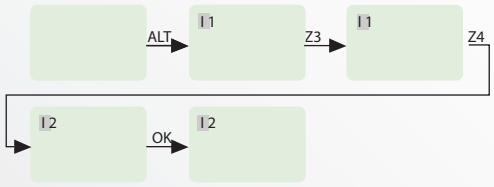
After four wrong attempts of entering the Password the Screen as shown below appears. Pressing OK here will delete all device data or press ESC to return to previous screen (pressing ESC will not delete).



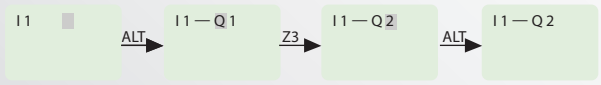
FUNCTIONS

CREATING OR EDITING A PROGRAM
To create a new program or edit an existing program, select the PROGRAM option from the main menu by pressing OK. Then select the EDIT option to create or edit.

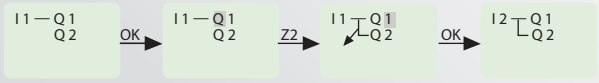
INSERTING A CONTACT
1. Place the blinking cursor in the required position.
2. Press ALT.
3. Choose the required element using the Up or Down keys.
4. Use the Right Arrow key to move to the number.
5. Choose the number using up or down keys.
6. Press ALT or Right Arrow to accept and to go to the next position.



INSERTING A COIL
1. Place the blinking cursor in the required position.
2. Press ALT.
3. Choose the required element using the Up or Down keys.
4. Use the Right Arrow key to call-up the number.
5. Choose the number using Up or Down keys.
6. Use the Left Arrow key to move to the type of coil.
7. Choose the type of coil using Up or Down keys.
8. Press ALT or Right Arrow to accept and to go to the next position.



ENTERING A LINK
1. Place the blinking cursor next to the desired location.
2. Press OK to start the link ("↙ ", "cursor").
3. Move the cursor to the desired location using the arrow keys.
4. As the cursor moves, the link is drawn.
5. Press OK to exit to normal mode.
6. Repeat this action as many times as necessary to link all the elements together as required.



DELETING A PROGRAM LINE
Move the cursor to the first column of the line, if necessary delete the elements one by one to create a blank line. Press DEL. The line is deleted. It is also possible to delete the entire program stored in the Series 900 relay. To do this, call up the "DELETE" option in the Program menu and validate the deletion of all program lines.

REPLACING A LINK WITH A CONTACT
To replace a link with a contact, simply place cursor at the required location and press ALT to enter the contact.

CHANGING AN ELEMENT
To change an element in an existing program, simply move to the element to change, press ALT and follow the same procedure as when entering a new element.

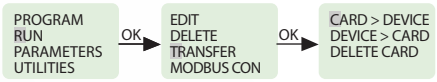
DELETING AN ELEMENT
To delete an element, simply place the cursor on the required element, and then press DEL. Generally, the deleted element must be replaced by a link.

DELETING LINKS BETWEEN ELEMENTS
To delete a link, simply move the cursor next to the desired position, press the OK key to change the cursor to á and press the DEL. key. This may delete some of the required connections, which may be restored by the same method as above.

INSERTING A PROGRAM LINE
To insert a program line, simply move the cursor to the first column of the line immediately above the one to create and press OK.

TRANSFER
The TRANSFER function allows data to be transferred from Memory Card to the Series 900 relay or vice-versa.

Transferring data to the memory card is useful when the user wants to load the same program in many Series 900 relay units. In this case, instead of using PC, user can make use of memory card, which is capable of storing one program. This feature is particularly useful on the production line where user is not required to edit and debug the program and a PC is not available. In this mode of transfer "PASSWORD" and "UTILITIES" such as Backlit Configuration and Expansion (Extension) module state will also get transferred with the program.

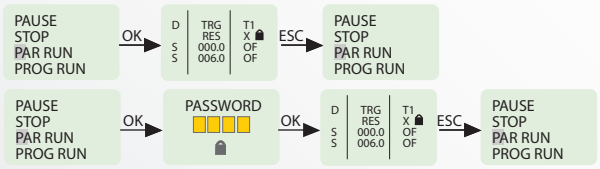


DEVICE TO CARD
1. Insert the Memory card in the connector after removing the serial cable, if present.
2. Select the "TRANSFER" function from the "PROGRAM" menu.
3. Press the OK key to validate.
4. Select the Device > Card function.
5. Press the OK key to validate.

CARD TO DEVICE
This transfer is used to reload an application into the Series 900 relay. It avoids the need to re-enter an existing application.
1. Insert the Memory card in the connector after removing the serial cable, if present.
2. Move cursor to the "TRANSFER" function from the "PROGRAM" menu.
3. Press the OK key to validate.
4. Select the Card > Device function.
5. Press the OK key to validate.

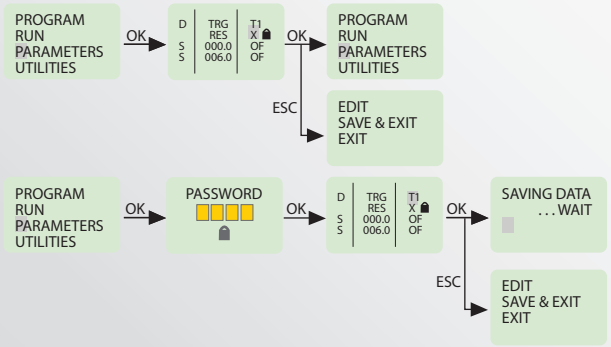
EDITING PARAMETERS OF SPECIAL FUNCTION BLOCKS
Parameters of special function blocks can be modified in two modes:
1. Run Mode
2. Program Stop Mode

RUN MODE
1. Enter the PASSWORD if it has been enabled.
2. Special function block with it's parameters set will be displayed.
3. Set parameters and press OK to save the parameters.
4. Press ESC to return to the RUN Mode menu.
5. Pressing ESC will return you to the RUN Mode menu and previous settings will be retained.



PROGRAM STOP MODE
1. Enter the PASSWORD if it has been enabled.
2. Press OK to save the parameters.
3. By pressing the ESC key the screen shown below will appear with the following three options:

EDIT:	Enter into PARAMETERS set mode.
SAVE & EXIT:	Save the parameters and come out of mode.
EXIT:	Retain previous settings and come out of set mode.



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c3controls®

FUNCTIONS

RUN MODE

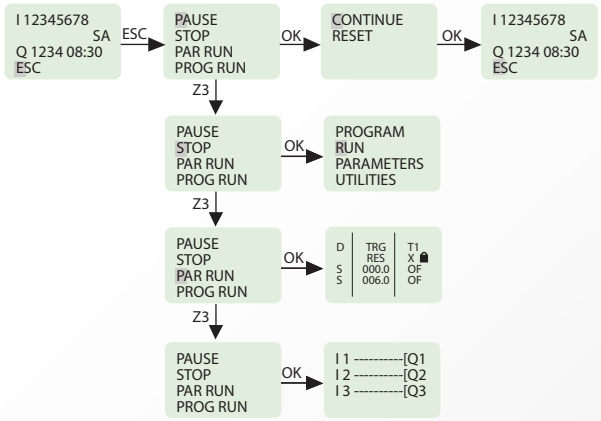
To enter into RUN mode select the "RUN" option in the main menu and press 'OK.'

If the CONTINUE option is selected then Program execution will proceed and the RUN mode display screen will appear as shown.

If the RESET option is selected then all special function block parameters are initialized and the RUN mode display screen will appear.

RUN MODE FUNCTIONS

During the RUN mode the user can enter the RUN Mode Functions by pressing the ESC key.



PAUSE

If the PAUSE option is selected by pressing OK then program execution is paused, and user has two options:

CONTINUE: Run with the parameters status it has or
RESET: Reset the parameters and run the program.

STOP

If the STOP option is selected by then the program execution is stopped and Main Menu is displayed on the screen.

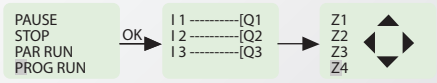
PAR RUN

If the PAR RUN option is selected then Parameter edit window of Special Function Block is displayed. The user can edit the parameters by using ALT, UP, DOWN, and OK keys.*

PROG RUN

If the PROG RUN option is selected then the ladder program is displayed on the screen. The user cannot edit the program and can only go through the program by using UP and Down keys.

If Z-Keys are used in the program then pressing the ALT key will display the Z-Key screen.



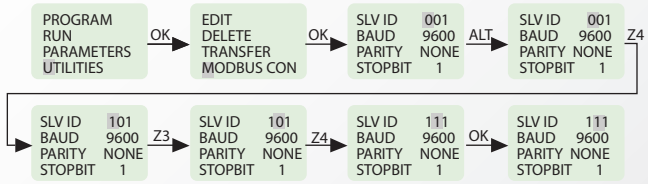
*Embedded parameters when unlocked and edited at run time will not be saved permanently in the device. This functionality is provided only to test the system during run time. To save parameters permanently, user has to stop the program, move to edit mode & configure the system accordingly.

NOTE: In Run Mode, expansion (extension) module identities cannot be changed.

MODBUS SETTINGS

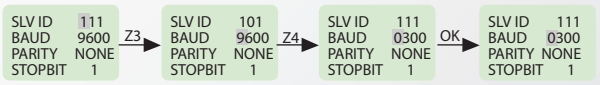
SLAVE ID

1. Select the "PROGRAM" option from the main menu and press OK.
2. Select the "MODBUS CON" option from the sub menu and press OK.
3. The cursor will blink on the first digit of the Slave ID (SLV ID).
4. Press ALT to edit the digit and the digit will now start blinking.
5. Using Up (Z4) and Down (Z2) keys select the appropriate digit.
6. Press Z3 to edit the other digit and using Up and Down keys select the digit.
7. Press OK to confirm the changes that have been made.



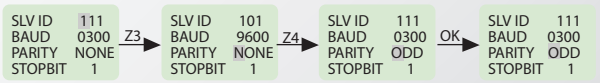
BAUD RATE

8. Press Z3 to select Baud Rate (BAUD) and press ALT to edit.
9. Using Up (Z4) and Down (Z2) keys select the appropriate Baud Rate.
10. Press OK to confirm the changes that have been made.



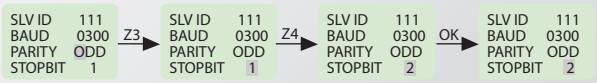
PARITY

11. Press Z3 to select 'PARITY' and press ALT to edit.
12. Using Up (Z4) and Down (Z2) keys select the appropriate parity.
13. Press OK to confirm the changes that have been made.

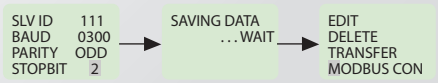


STOP BITS

14. Press Z3 to select 'STOPBIT' and press ALT to edit.
15. Using Up (Z4) and Down (Z2) keys select the number of stop bits.
16. Press OK to confirm the changes that have been made.

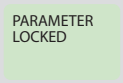


17. Once all the changes have been made press OK to save and exit.



PARAMETER LOCK

When user edits parameter from text message and if parameter is locked then the screen as shown below appears. To change that parameter user has to edit that parameter in edit mode only.



PROGRAMMING USING SPR-SOFT III SOFTWARE

SPR-soft III is the exclusive programming software for the Series 900 relay using Windows®. It facilitates:

ENTERING THE PROGRAM: SELECT & PLACE
SPR-soft III provides a user-friendly interface wherein the user has to only select contact type and contact number and place it where it is required. Contacts get connected automatically if they are on the same line. User can enter comments for better readability and for future reference.

SAVING PROGRAMS
SPR-soft III allows user to save individual programs on the PC.

DEBUGGING
SPR-soft III is very powerful in error handling. It displays any possible errors as the program is being entered to make corrections simultaneously.

SIMULATION ON PC
User can simulate the program on a PC. User can use buttons provided on the screen to simulate the input connections. Scroll bar can be used to simulate Analog input. The actuation / de-actuation of the relays can be monitored on the screen.

SIMULATION ON THE SERIES 900 RELAY
User can connect the Series 900 relay unit to a PC using a serial Communication cable / USB cable and perform on line program simulation. In this mode the PC acts as a master and the inputs are taken from the Series 900 relay and outputs are sent to the Series 900 relay unit (and the expansion modules, if connected). This mode is useful in debugging the entire system since the actual I/Os are used.

PRINTING
User can take print outs of programs in two different formats, namely Short format and Detail format. Also, program Parameters and Comments can be printed.

TRANSFERRING PROGRAMS
Programs can be transferred from a PC to the Series 900 relay and vice-versa using serial Communication cable / USB cable. This saves the program entering time on the Series 900 relay.

TRANSFERRING CLOCK
With this utility user can set the clock (date and time) on the Series 900 relay.

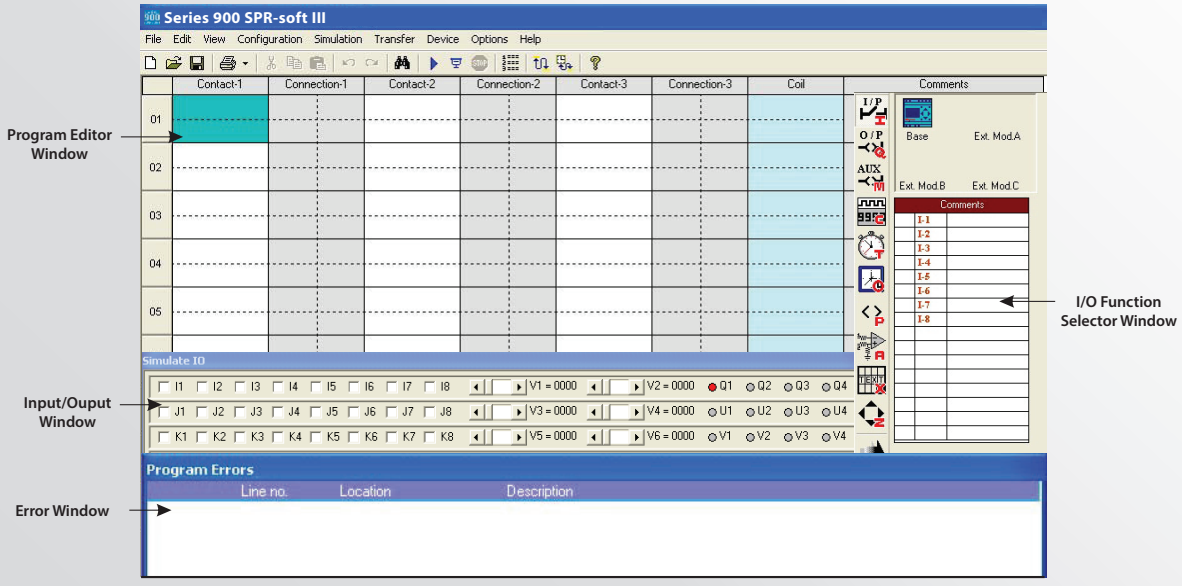
CREATING A NEW PROGRAM
Select File -> New from the menu bar to create a new program.
A blank screen will appear. Now you can start entering the program. Ensure that you have chosen the proper Series 900 relay Configuration before starting the program entry.

CHOOSING CONTACT TYPE
Position the cursor at the place where you want to insert the contact by a left click with the mouse. The position will get highlighted. Choose the required contact type and Contact Number from I/O function selector. Click on the required contact and contact number, which will be highlighted for a few seconds. The selected contact will appear at the position selected in the program. The selected contact number will be shown with a tick mark to indicate that it has been used in the program. You can right click on any of the contacts to change its type and properties.

CONNECTING INPUTS & OUTPUTS
Each circuit connection runs from left to right. Please remember this when you interconnect contacts and relay coils. User can draw a circuit connection horizontally from left to right and vertically between adjacent circuit connections. An intersection of circuit connections represents an electrical connection.

HORIZONTAL CONNECTION
To make a horizontal connection, click on the horizontal dotted line in the connection box of the circuit. Or to make a connection in the contact box, press the right button and select "Joining Link". Generally when an output coil is placed in the fourth column, it gets automatically connected.

VERTICAL CONNECTION
To make a vertical connection click on the vertical dotted line in the connection box of the circuit. Vertical connection represents OR connection. For deleting a connection, left click on the connection line.



WORKING WITH SPR-SOFT III

TO SET & REMOVE PASSWORD

1. Select the Configuration >Device Utilities menu command. The Device Utilities window will appear.
2. Click on set password.
3. Enter four digit passwords into the two boxes "New Password" and "Confirm New Password" then confirm with OK.
4. You can delete your assigned password at any time. To do this, enter the existing password in the "Old Password" box, then confirm with OK.
5. To change the password, you must first enter the new password in the two boxes "New Password" and "Confirm Password" and the existing password in the Current Password text box. Then confirm with OK.

TO SET BACKLIT MODE

1. Select the Configuration >Device Utilities menu command. The Device Utilities window will appear.
2. Select the mode Auto, On or Off then click on the set mode button.
3. The requested operation will move the device out from the run mode. The message "Do you want to continue?" will appear.
4. By pressing Yes, the backlit mode will be set and the message "Backlit mode has been set successfully" will appear.

TO CONFIGURE COMMUNICATION PORT

1. Select the Options > Comm port menu command. The COM Port settings window will appear with two option buttons to select the Port.
2. Select "Device is connected to USB Port" when the device is connected with a cable.
3. Select "Device is connected to Serial Communication Port" when the device is connected with a Serial Communication cable.

TO SET COMMUNICATION PARAMETERS

1. Select the Options > Comm port menu command. The COM Port setting window will appear.
2. The user can set the following communication parameters:

SLAVE ID:	Selectable from 1 to 247
BAUD RATE:	Selectable as 1200, 2400, 4800, 9600 baud
PARITY:	Selectable as NONE, EVEN and ODD
STOP BIT:	Selectable as 1 and 2 Stop Bits

CLOCK SETTING

1. Select the Transfer > Device Clock menu command. The Device Clock window will appear.
2. To view the Date and Time of the device: Click Read button on the clock setting window.
3. To set the Date and Time in the device: User can select Date and Time to write into the device. Click Write button on the clock setting window.

DST (DAYLIGHT SAVINGS TIME) SETTING

1. Select the Transfer > Device Clock menu command. The Device Clock window will appear.
2. To set Enable DST, Select "Click Daylight Saving Time" the DST setting section will now be visible.
3. User can select the following parameters: Begin Week, Begin Day, Begin Month, Begin Time, End Week, End Day, End Month, End Time, Offset Time.
4. To set Disable DST:
   - Deselect Daylight Saving Time option and the DST window will be disabled.
   - Press Set DST.
5. To read DST: Press Read DST, independent of the DST enable or disabled.

TRANSFER OPTIONS

PC to Device

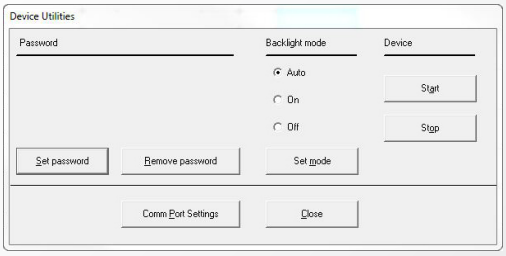
1. Select the Transfer > Program menu command. The transfer window will appear.
2. Press "PC to Device" button on transfer dialog box. Current program on the screen will be transferred to the device.
3. Transfer completion message "The Program is downloaded successfully" will appear on the screen.

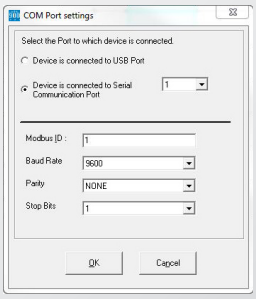
Device to PC

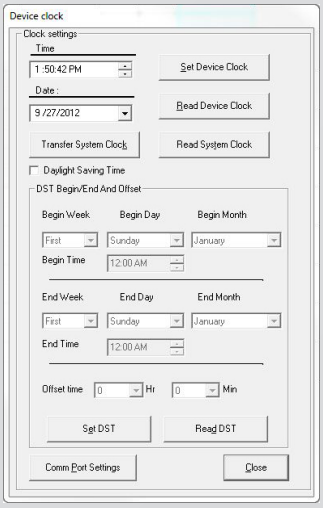
1. Select the Transfer > Program menu command. The transfer window will appear.
2. Press "Device to PC" button on the transfer dialog box. Current program on the screen will be transferred to the device.
3. Transfer completion message "The Program is downloaded successfully" will appear on the screen.
4. Read program will be shown on the main screen.

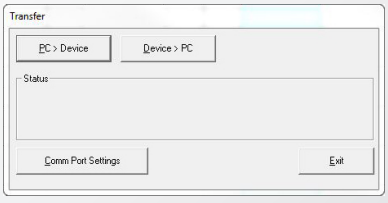
Expansion Module Selection

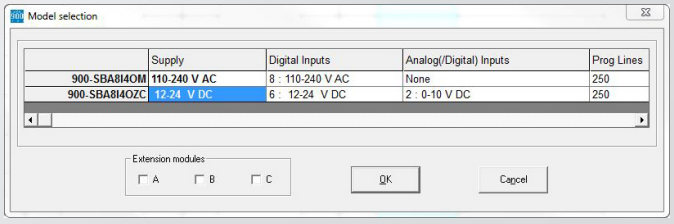
1. Select the Configuration >PLC Model menu command. The Model Selection window will appear.
2. Selection of the Series 900 relay model and Expansion modules. Maximum three expansion modules can be connected to one Series 900 relay.











SAMPLE PROGRAMS

FACTORY/SCHOOL SCHEDULE

Opening bell at 8am announces start of work or class (bell to last 10 sec and stop): Bell at 10:30am announces start of coffee break, Bell at 10:45am announces end of coffee break, Bell at 12 noon announces lunch, Bell at 12:45 announces end of lunch, and Bell at 5pm announces end of work day.

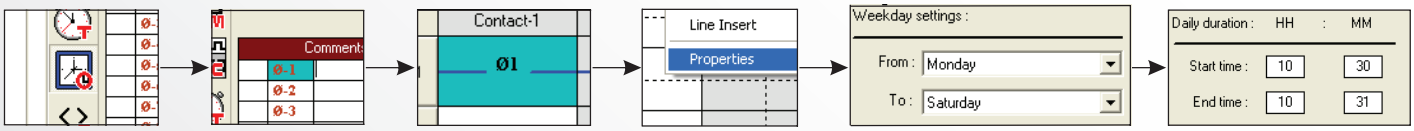
PROGRAMMING

For the six time periods 1 hour factory/school schedule, six Time Switches are required. ◷1, ◷2, … ◷6 represent the six Time Switches.

- Timer T1 ensures that the duration of the output is 10 seconds only.
- Q1 represents the Output Coil (Alarm/Bell in this case).
- Double click on the SPR Soft icon to launch the SPR Soft Software application.
- Click on File > New to launch a new Program window.

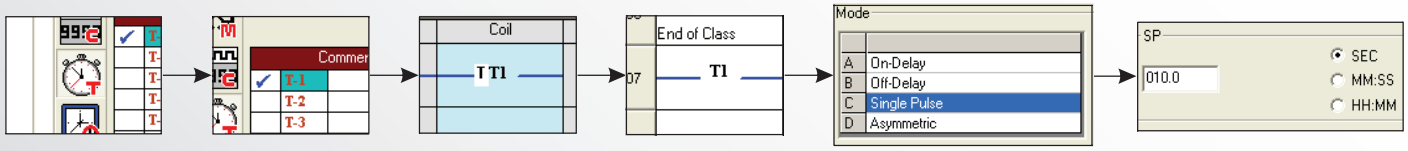
TIME SWITCH SELECTION & PARAMETER EDITING

1. Click on the Time Switch symbol in the I/O selector window and select Time Switch 1 (◷1).
2. Move the cursor to the 'Contact 1' column of the first row and left click on the block to place the Time Switch.
3. Right click on the Time Switch and select properties to open the properties window.
4. In the Weekday settings option select 'From' as Monday and 'To' as Saturday.
5. In the Daily Duration option enter the start time as 10:30 and since we want the siren for 10 sec. enter end time as 10:31.
6. Similarly select the other 5 Time Switches and enter the times as described above and place them in the contact 1 column of lines 2, 3, 4, 5 & 6.



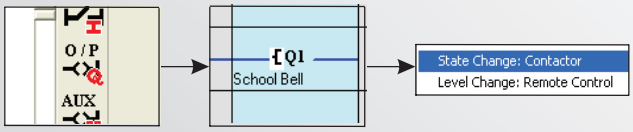
TIMER SELECTION & PARAMETER EDITING

7. Select Timer T1 from the I/O selector window and place it in the coil column of line 1 and contact column of line 7.
8. Open the Timer properties window and select the mode as Interval and enter the time duration i.e. SP as 10 sec.
9. Connect the lines from all the Time Switches to the Timer:



OUTPUT CONFIGURATION

10. Select Output Q1 from the I/O selector window and place it in the coil column.
11. Right click on output Q1 and select the option 'State Change: Contactor.'



LADDER PROGRAM

	Contact-1	Connection-1	Contact-2	Connection-2	Contact-3	Connection-3	Coil
01	Ø1 Start of class						T1
02	Ø2 Start of Coffee						
03	Ø3 End of Coffee break						
04	Ø4 Start Lunch Break						
05	Ø5 End of Lunch Break						
06	Ø6 End of Class						
07	T1						Q1 School Bell

SAMPLE PROGRAMS

CAR PARKING

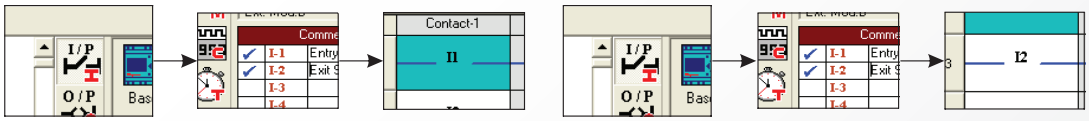
There are five (5) parking spots available in a parking area. There are two (2) sensors, one at the entry gate and one at the exit gate. When all the parking spots are occupied, there is a lamp outside the entry gate indicating parking is full. When a parking spot becomes available, the lamp is switched ON indicating parking is available.

PROGRAMMING

Input I1 is the sensor at the Entry gate and Input I2 is the sensor at the exit gate.
Output Q1 indicates that Parking is available; Output Q2 indicates that Parking is Full.
Counter C1 is used to count the number of vehicles that have entered or exited the parking.
Compare Counters P1 & P2 are used to switch ON outputs Q1 & Q2 respectively by comparing the count of counter C1.

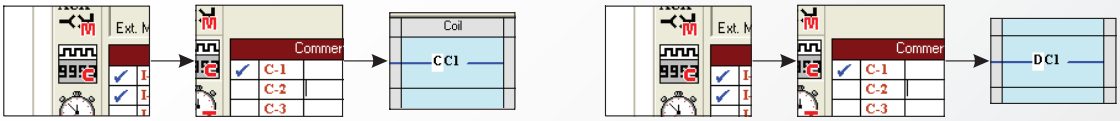
INPUT SELECTION

1. Click on the Input symbol in the I/O selector window and select "I1."
2. Move the cursor to the Contact 1 column of the first row and left click on the block to place the input.
3. Click on the Input symbol in the I/O selector window and select "I2."
4. Move the cursor to the Contact 1 column of the second row and left click on the block to place the input. Also place it in the Contact 1 column of the third row.



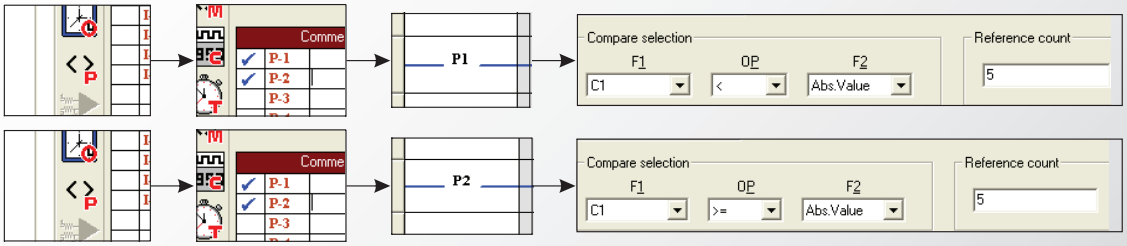
COUNTER SELECTION & PARAMETER EDITING

5. Select Counter C1 from the I/O selector window and place it in the coil column of line 1. Right click on the counter and select the option counting input.
6. Select the same counter C1 and place it in the coil column of line 3. Right click on the counter and select the option direction input.



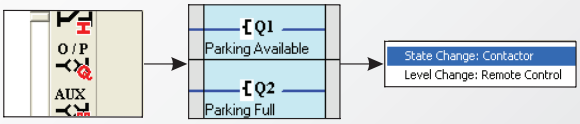
COMPARE COUNTER SELECTION & PARAMETER EDITING

7. Select Compare Counter P1 from the I/O selector window and place it in the contact column of line 4.
8. Right click on the compare counter and select properties.
9. Under the compare selection option, select 'F1' as 'C1', 'OP' as '<', 'F2' as 'Abs Value' and reference count as 5.
10. Select Compare Counter P2 from the I/O selector window and place it in the contact column of line 5.
11. Right click on the compare counter and select properties.
12. Under the compare selection option, select 'F1' as 'C1', 'OP' as '=', 'F2' as 'Abs Value' and reference count as 5.

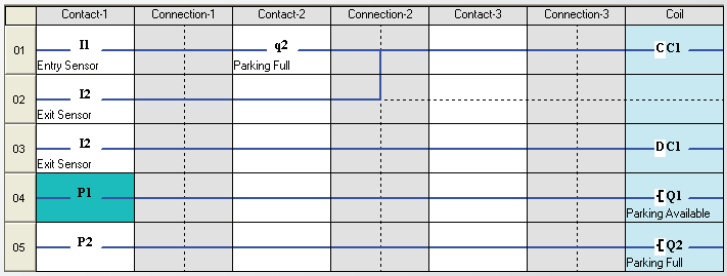


OUTPUT CONFIGURATION

13. Select Output Q1 from the I/O selector window and place it in the coil column.
14. Right click on output Q1 and select the option 'State Change: Contactor.'



LADDER PROGRAM



TECHNICAL SPECIFICATIONS

		900-SBA8I4OZC	900-SBA8I4OM	900-SEA8I4OZC	900-SEA8I4OM
ELECTRICAL GENERAL					
	UNITS				
Operating Voltages		12 ~ 24V DC	80 ~ 265V AC	12 ~ 24V DC	80 ~ 265V AC
Power Consumption	VA	5			
Current Draw	mA	360	36	360	36
Protection Reverse Polarity (for the supply)		Yes	NA	Yes	NA
Number of I/O		8 Inputs / 4 Outputs			
Input Type					
Number of Digital Inputs		8			
Number of Analog Inputs		2	0	2	0
Output Type		Relay			
I/O Expansion		Yes			
Maximum Number		3			
Modbus Communication		Yes			
Type		RTU			
Master/Slave		Slave			
AVAILABLE FUNCTIONS					
Timers		16			
Timing Functions		13			
Counters		16 Up / Down			
Selective Retentive		Yes			
Count Limit		5 Digits			
Counter Scaling		Yes			
Time Switches (RTC)		16 Weekly			
Analog Comparators		12	0		
Analog Scaling		Yes			
Hour Meter		Yes			
Compare Counters		16			
Count Limit		5 Digits			
Soft Text Messages		16 Priority Driven			
Auxiliary/Holding Relays		64			
PROCESSING CHARACTERISTICS					
Cycle Time	msec.	100 with all special function blocks and retentive timers			
Response Time	msec.	8.5 + Cycle Timer			
Backup Duration	Hrs.	100			
Clock Accuracy		1.7 sec per day			
Timer Block Accuracy					
Seconds	msec.	±5			
Minute-Seconds	msec.	±330			
Hour-Minutes	s	±20			
INPUT CHARACTERISTICS					
Digital Inputs					
Input Range	V	0 ~ 4V DC – Off 8 ~ 26.5V DC – On	0 ~ 40V AC – Off 85 ~ 265V AC – On	0 ~ 4V DC – Off 8 ~ 26.5V DC – On	0 ~ 40V AC – Off 85 ~ 265V AC – On
Maximum Voltage	V	26.5V DC	265V AC	26.5V DC	265V AC
Maximum Input Frequency	Hz	10	5	10	5
Analog Inputs					
Number of Analog Inputs		2	NA	2	NA
Input Range	V	0 ~ 10V DC (10-bit resolution)	NA	0 ~ 10V DC (10-bit resolution)	NA
Input Impedance	W	8	NA	8	NA
Maximum Input Voltage	V	26.5V DC	NA	26.5V DC	
Maximum Cable Length Between Modules	cm	15			

		900-SBA8I4OZC	900-SBA8I4OM	900-SEA8I4OZC	900-SEA8I4OM
OUTPUT CHARACTERISTICS					
	UNITS				
Operating Range	V	10 ~ 26.5V DC or 85 ~ 265V AC			
Contact Type		Form A			
Maximum Operating Current					
Resistive Load	A	8			
Inductive Load	A	5 (at cosφ = 0.4)			
Maximum Switching Rate					
Mechanical	Ops/hr.	360,000			
Electrical	Ops/hr.	360			
Mechanical Life	Ops.(mil)	10			
Electrical Life	Ops.	100,000			
CONSTRUCTION					
Ingress Protection					
Enclosure		IP40			
Terminals		IP20			
Terminal Capacity					
Solid Strand	mm^2	1.0 ~ 2.5			
Fine Strand	mm^2	1.0 ~ 2.5			
	AWG	18 ~ 14			
Tightening Torque	Nm	0.5 ~ 0.8			
	Lb-in.	5 ~ 7			
Weight	g	232	248	232	248
	oz.	8.2	8.7	8.2	8.7
Ambient Operating Temperature		0 to +50° C (+32 to +122° F)			
Ambient Storage Temperature		-20 to +70° C (-4 to +158° F)			
Shock		30g at 11msec (Non-repetitive)			
Vibration		5g			
Humidity		35% to 85% Relative Humidity (Non-condensing)			
Altitude		2,000m (6,528ft.)			
ROHS COMPLIANCE		For RoHS compliance documentation by product, refer to www.c3controls.com.			

SYSTEM REQUIREMENTS

Windows 2000, XP, Vista, 7, & 8
Pentium II PC (200 MHz or higher)
256MB RAM
80MB free hard drive space
Screen Resolution 800x600 or better

CERTIFICATIONS

Conformity to Standards:
UL 508
IEC 61000-4, 61010

Certifications:
UL File#: E334798 (Guide NRAQ, NRAQ7)
CE Marked (per EU Low Voltage Directive 2006/95/EC and EMC 2004/108/EC)

Visit www.c3controls.com to download product certifications.

series 900 SMART **PROGRAMMABLE RELAYS**

APPLICATIONS

MACHINE CONTROLS
- Motor, pump and valve controls
- Air compressors
- Exhaust and filtering systems
- Water-treatment plants
- Woodworking machinery
- Etching and purification plants

OPERATIONAL MONITORING SYSTEMS
- Access control
- Vehicle control monitoring
- Alarm systems
- Level limit monitoring
- Traffic light control systems
- Baggage handling

HVAC CONTROLS
- Energy management
- Heating control
- Cooling systems
- Ventilation systems
- Air conditioning systems

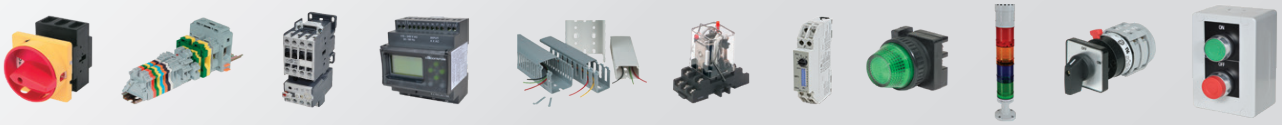
RESIDENTIAL AND COMMERCIAL BUILDING SERVICES
- Interior and exterior lighting control
- Door/gate control
- Shutter, sun blind, and awning control
- Irrigation system control

TRANSPORT FACILITIES
- Conveyor systems
- Hoisting platforms
- Elevators
- Silo facilities
- Livestock feed delivery

OTHER APPLICATIONS
- Solar-electric systems
- Marine applications
- Harsh environments
- Display panels and traffic control signs

ORDERING INFORMATION

CATALOG NUMBER	PRODUCT DESCRIPTION
900-SBA8I4OZC	Smart Programmable Relay, Base Module, 8 Inputs/4 Outputs, 12-24V DC
900-SBA8I4OM	Smart Programmable Relay, Base Module, 8 Inputs/4 Outputs, 110-240V AC
900-SEA8I4OZC	Smart Programmable Relay, Expansion Module, 8 Inputs/4 Outputs, 12-24V DC
900-SEA8I4OM	Smart Programmable Relay, Expansion Module, 8 Inputs/4 Outputs, 110-240V AC
900-SCM1ZC	RS 485, 12 ~ 24V DC Communication Module
900-SCM1M	RS 485, 110 ~ 240V AC Communication Module
900-SMEM1A	Memory Card
900-SCC1A	PC Serial Cable
900-SCC2A	USB Cable
900-SSW1	Software supplied on CD-ROM compatible with Windows, 2000, XP, Vista, 7, & 8



LIFETIME WARRANTY
GUARANTEED SAME-DAY SHIPPING
ADVANTAGE PRICING

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