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Contact us

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

SG2 PLR USER Manual

SG2 Programmable Logic Relay

Table of Contents

Chapter 1: Getting Started

The SG2 PLR is an electronic device. For safety reasons, please carefully read and follow the paragraphs with "WARNING" or "CAUTION" symbols.They are important safety precautions to be aware of while transporting, installing, operating, or examining the SG2 Controller.

WARNING: Personal injury may result from improper operation.

CAUTION: The SG2 PLR may be damaged by improper operation.

Precaution for Installation

Compliance with the installation instructions and the user manual is absolutely necessary. Failure to comply could lead to improper operation, equipment damage or in extreme cases even death, serious bodily injury or considerable damage to property.

When installing the open-board models, insure that no wiring or foreign materials can fall into the exposed circuits and components. Damage to equipment, fire, or considerable damage to property could result.

Always switch off power before you wire, connect, install, or remove any module.

The wiring for the SG2 PLR is open and exposed. For the open-board models, all electrical components are exposed. For this reason, it is recommended the SG2 PLR be installed in an enclosure or cabinet to prevent accidental contact or exposure to the electrical circuits and components.

Never install the product in an environment beyond the limits specified in this user manual such as high temperature, humidity, dust, corrosive gas, vibration, etc.

Precaution for Wiring

Improper wiring and installation could lead to death, serious bodily injury or considerable damage to property.

The SG2 PLR should only be installed and wired by properly experienced and certified personnel.

Make sure the wiring of the SG2 PLR meets all applicable regulations and codes including local and national standards and codes.

Be sure to properly size cables for the required current rating.

Always separate AC wiring, DC wiring with high-frequency switching cycles, and low-voltage signal wiring.

Precaution for Operation

To insure safety with the application of the SG2 PLR, complete functional and safety testing must be conducted. Only run the SG2 after all testing and confirming safe and proper operation is complete. Any potential faults in the application should be included in the testing. Failure to do so could lead to improper operation, equipment damage or in extreme cases even Death, serious bodily injury or considerable damage to property.

When the power is on, never contact the terminals, exposed conductors or electrical components. Failure to comply could lead to improper operation, equipment damage or in extreme cases even death, serious bodily injury or considerable damage to property.

It is strongly recommended to add safety protection such as an emergency stop and external interlock circuit in case the SG2 PLR operation must be shut down immediately.

Examination Before Installation

Every SG2 PLR has been fully tested and examined before shipment. Please carry out the following examination procedures after unpacking your SG2 Programmable Logic Relay.

- Check to see if the model number of the SG2 matches the model number that you ordered.
- Check to see whether any damage occurred to the SG2 during shipment. Do not connect the SG2 PLR to the power supply if there is any sign of damage.

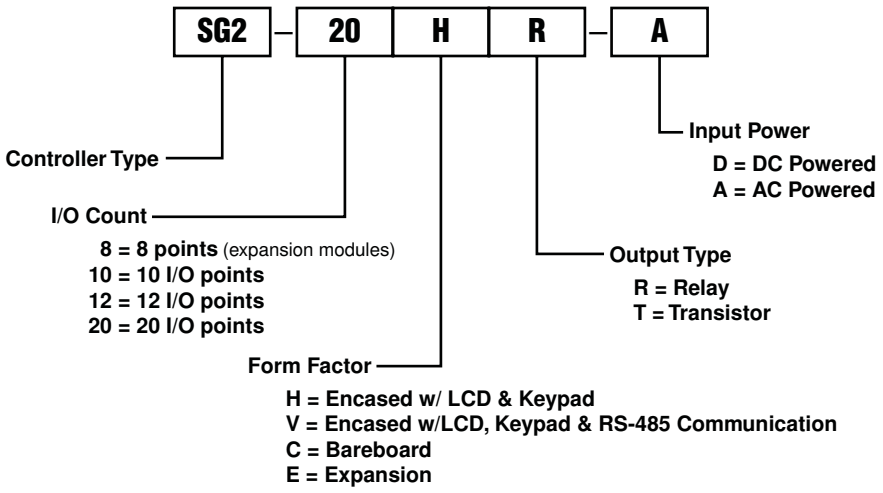
Contact FactoryMation if you find any abnormal conditions as mentioned above.

Environmental Precautions

The installation site of the SG2 PLR is very important. It relates directly to the functionality and the life span of your SG2 . Please carefully choose an installation site that meets the following requirements:

- Mount the unit vertically
- Environment temperature: 32°F - 131°F (0°C - 55°C)
- Avoid placing SG2 close to any heating equipment
- Avoid dripping water, condensation, or humid environment
- Avoid direct sunlight
- Avoid oil, grease, and gas
- Avoid contact with corrosive gases and liquids
- Prevent foreign dust, flecks, or metal scraps from contacting the SG2 PLR
- Avoid electric-magnetic interference (soldering or power machinery)
- Avoid excessive vibration; if vibration cannot be avoided, an anti-rattle mounting device should be installed to reduce vibration.

SG2 Model Identification

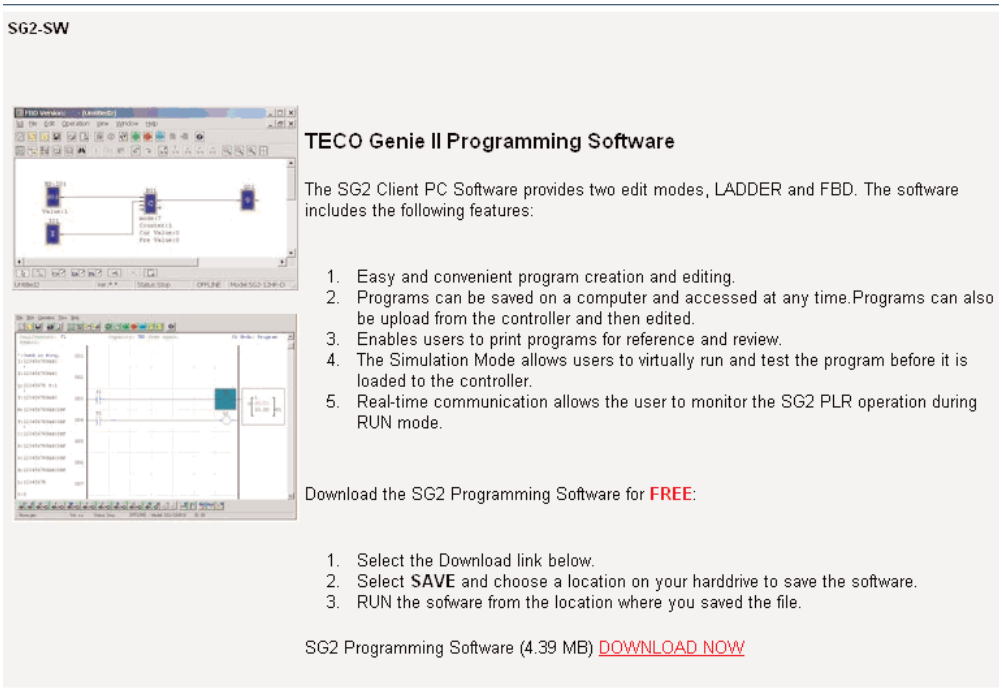


Quick Start Setup

This section is a simple 6-step guide to connecting, programming and operating your new SG2 Programmable Logic Relay. This is not intended to be the complete instructions for programming and installation of your system. Many steps refer to other sections in the manual for more detailed information.

1. Install SG2 Client Software

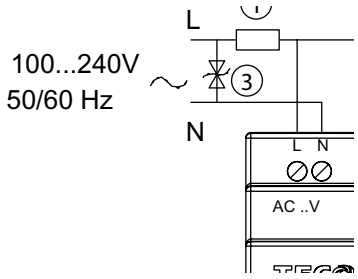
Install the SG2 Client Software from CD or from the free internet download at www.factorymation.com



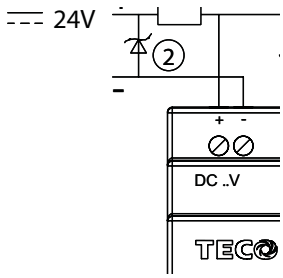
2. Connect Power to SG2 PLR

Connect power to the PLR using the below wiring diagrams for AC or DC supply for the applicable models. See “Chapter 2: Installation” for complete wiring and installation instructions

AC (100-240V)



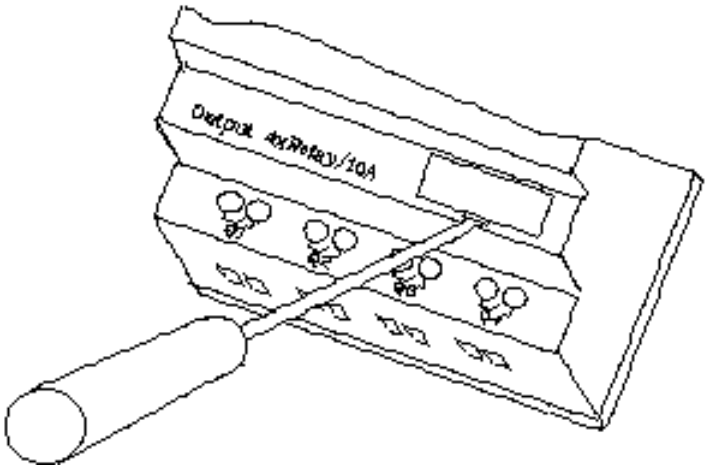
DC (24V)

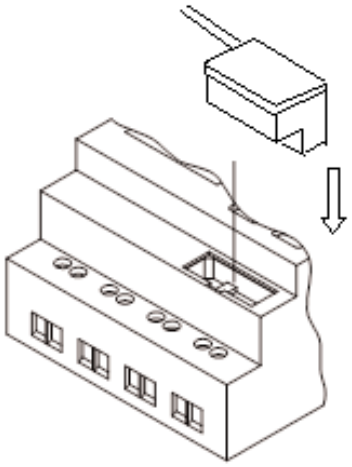


① Fuse (2A)
② Surge absorber (36V DC)
③ Surge absorber (400V AC)

3. Connect Programming Cable

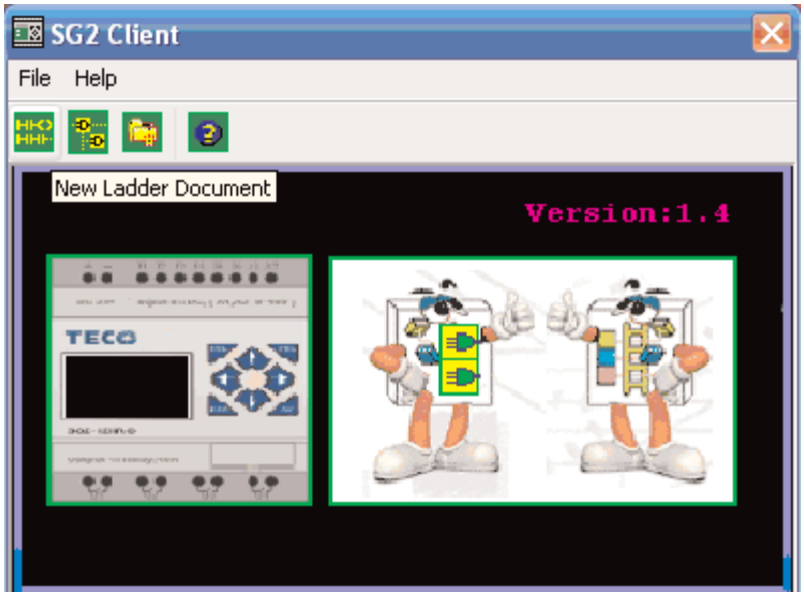
Remove the plastic connector cover from the SG2 using a flathead screwdriver as shown in the figure below. Insert the plastic connector end of the programming cable into the SG2 PLR as shown in the figure below. Connect the opposite end of the cable to an RS232C serial port on the computer.



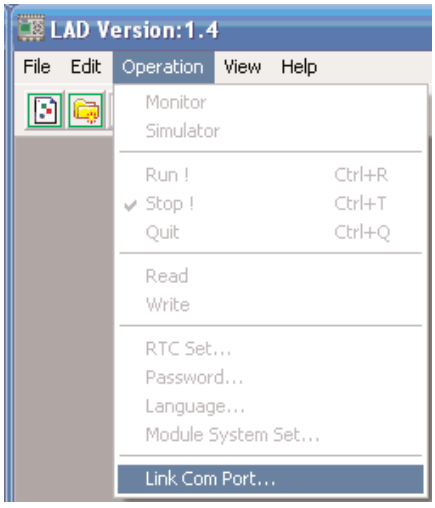


4. Establish Communication

a. Open the SG2 Client software and select “New Ladder Document” as shown below.

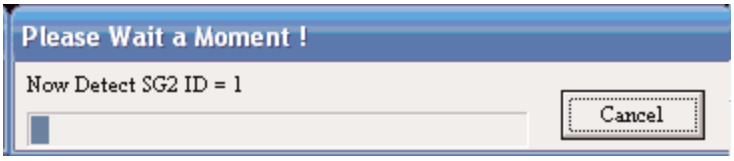


b. Select “Operation/Link Com Port…” as shown



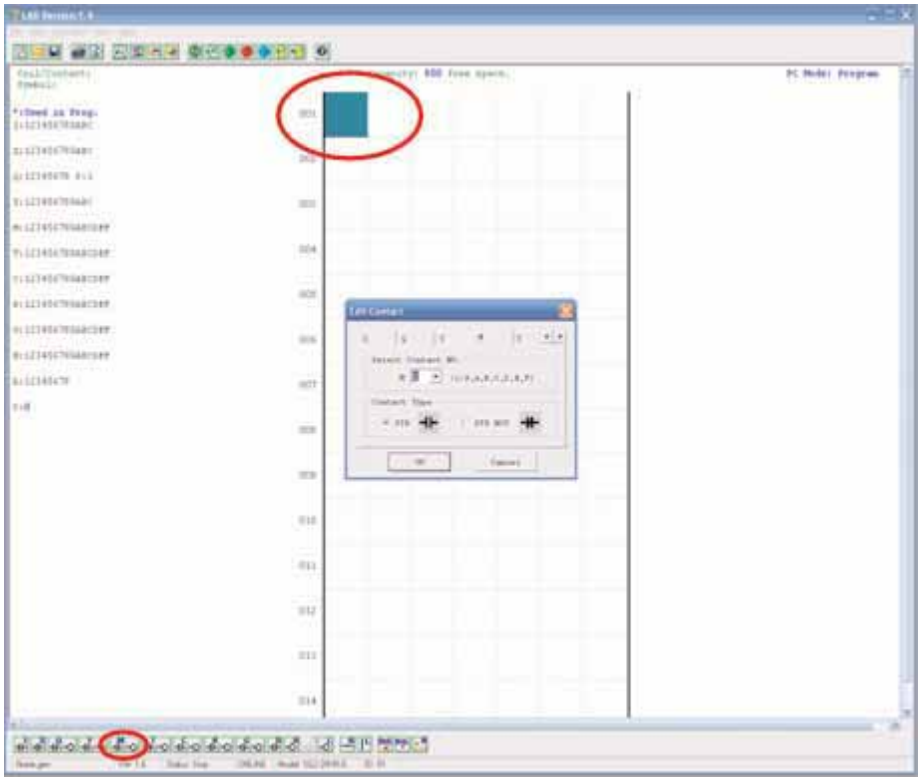
c. Select the correct Com Port number where the programming cable is connected to the computer then press the “Link” button.

d. The SG2 Client will then begin to detect the connected PLR to complete it’s connection as shown below.



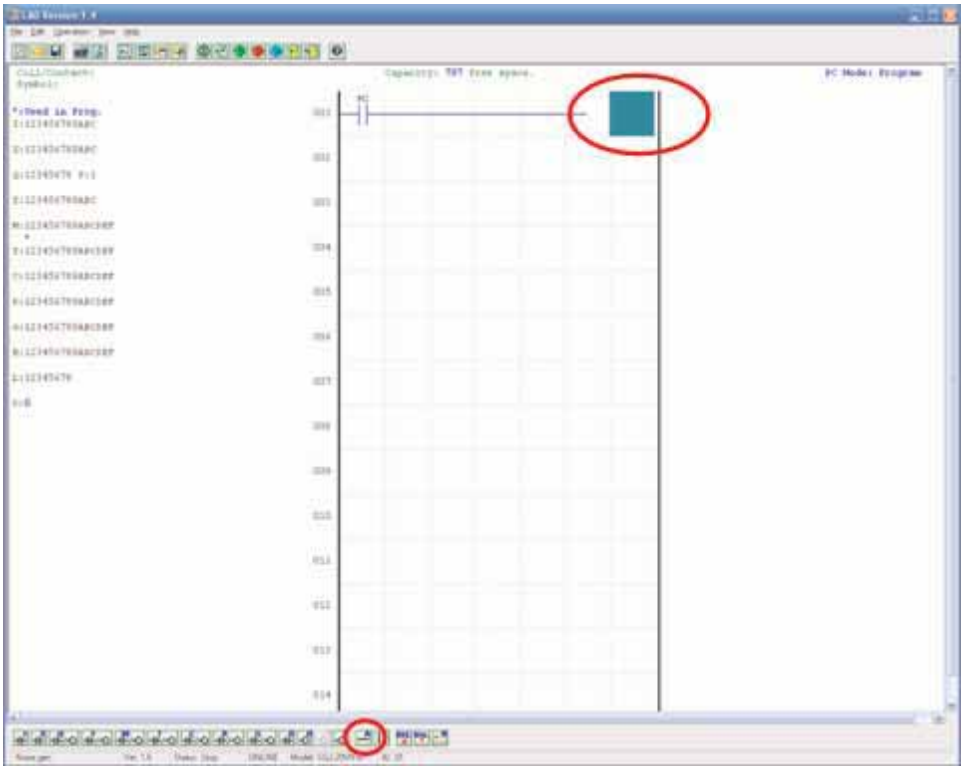
5. Write simple program

a. Write a simple one rung program by clicking on the leftmost cell at line 001 of the programming grid, then click on the “M” contact icon on the ladder toolbar, as shown below. Select M1 and press the OK button. See Chapter 4: Ladder Programming instructions for complete instruction set definitions.

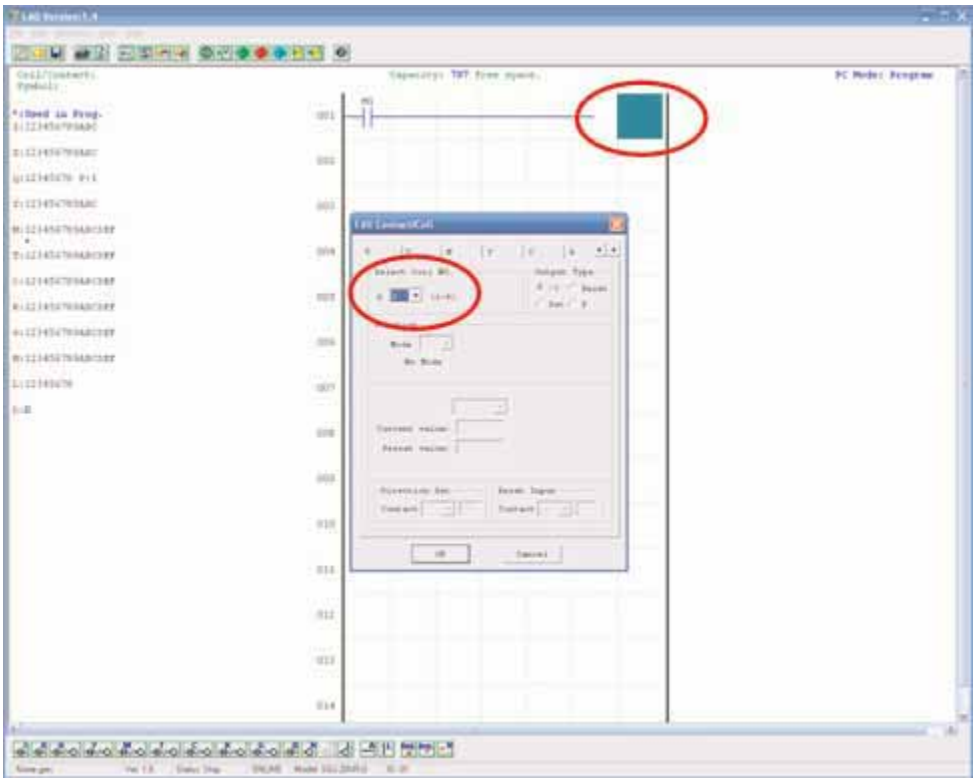


Note: If the ladder toolbar is not visible at the bottom of the screen, select View>Ladder Toolbar from the menu to enable.

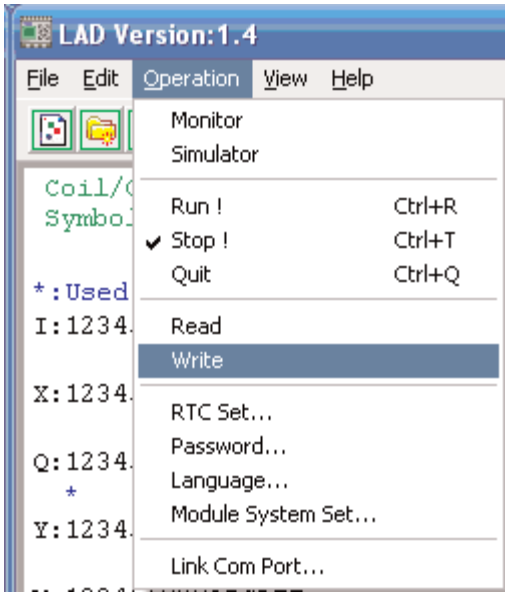
b. Use the “A” key on your keyboard (or the “A” icon from the ladder toolbar) to draw the horizontal circuit line from the M contact to the right most cell, as shown below.



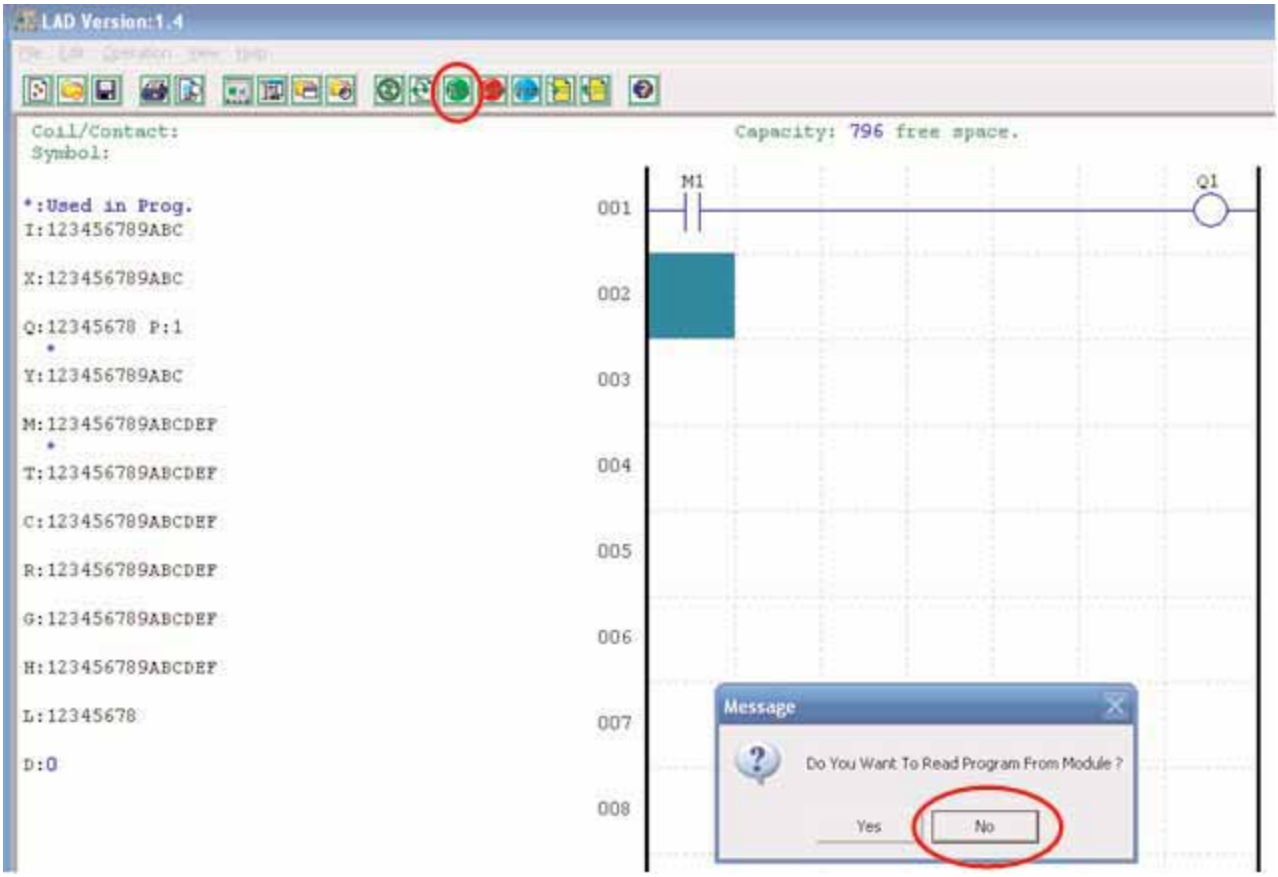
c. Select the “Q” coil icon from the ladder toolbar and drop it on the right most cell. Select Q1 from the dialog and press OK as shown below. See Chapter 4: Ladder Programming instructions for complete instruction set definitions.



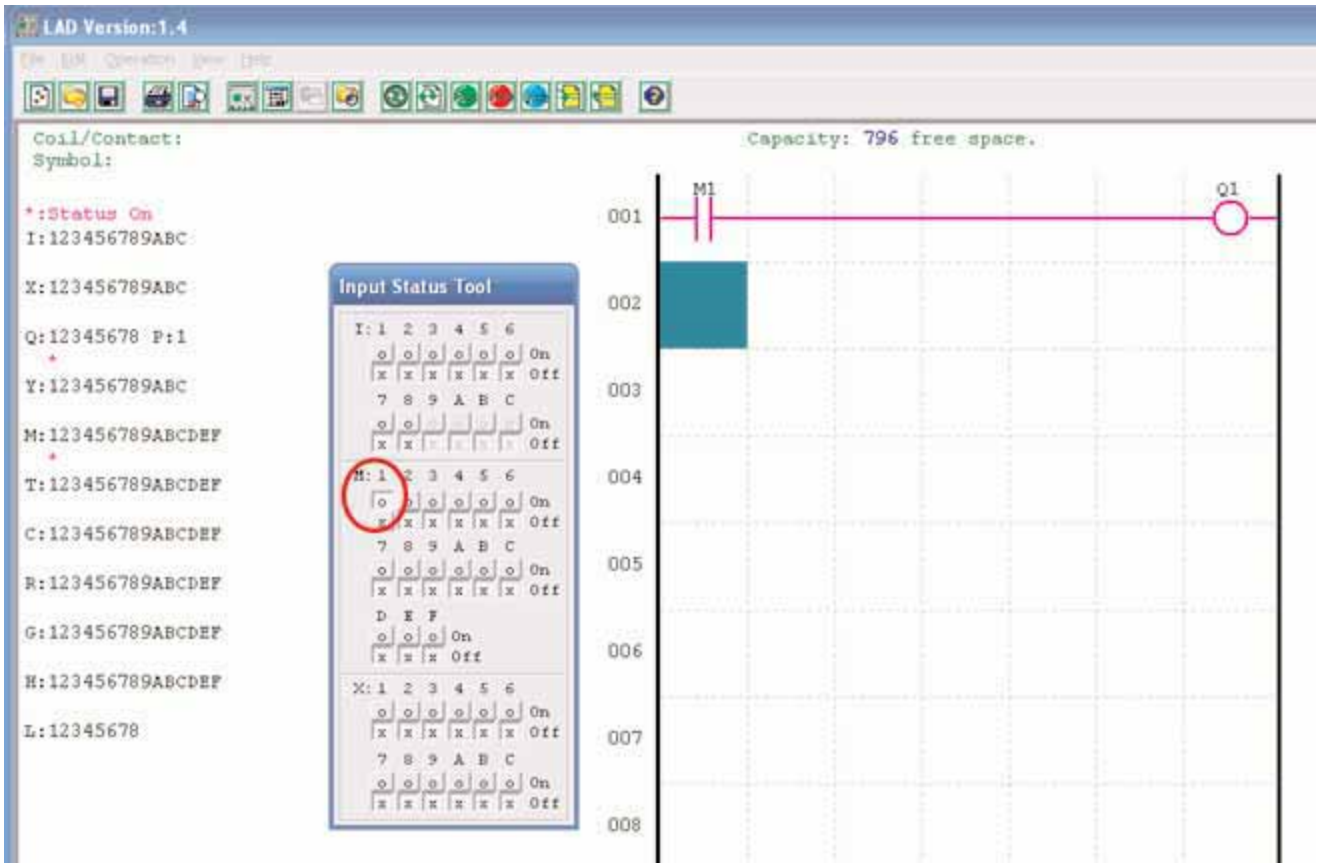
d. Test the simple program. From the Operation menu, select the Write function and write the program to the connected PLR as shown below.



e. Select the RUN icon from the toolbar, and select “No” when the pop-up message asks “Do you want to read program from module?”, as shown below.



f. From the Input Status dialog, click on M1 to activate the contact M1 which will turn ON the Output Q1, as shown below. The highlighted circuit will show active and the first Output (Q1) on the connected PLR will be ON. See Chapter 3: Programming Tools for more detailed software information.



Chapter 2: Installation

General Specifications

SG2 is a miniature smart PLR (Programmable Logic Relay) with a maximum of 44 I/O points and can be programmed in Relay Ladder Logic or FBD (Function Block Diagram) program. The SG2 can expand to its maximum I/O count by adding 3 groups of 4-input X 4-output modules.

Power Supply	
Input Power Voltage Range	DC Models: 20.4-28.8V AC Models: 85-265V
Power Consumption	24VDC: 10-point, 90mA 20-point: 150mA 100-240VAC: 90mA
Wire Size (all terminals)	26 to 14 AWG
Programming	
Programming languages	Ladder/Function Block
Program Memory	200 Lines or 99 Function Blocks
Programming storage media	Flash
Execution Speed	10ms/cycle
LCD Display	4 lines x 12 characters
Timers	
Maximum Number	15
Timing ranges	0.01s–9999min
Counters	
Maximum Number	15
Highest count	999999
Resolution	1
RTC (Real Time Clock)	
Number available	15
Resolution	1min
Time span available	week, year, month, day, hour, min
Compare Instructions (Analog, Timer, or Counter Values)	
Number available	15
Compare versus other inputs	Timer, Counter, or Numeric values
Environmental	
Enclosure Type	IP20
Maximum Vibration	1G according to IEC60068-2-6
Operating Temperature Range	32° to 131°F (0° to 55°C)
Storage Temperature Range	-40° to 158°F (-40° to 70°C)
Maximum Humidity	90% (Relative, non-condensing)
Vibration	0.075mm amplitude 1.0g acceleration
Weight	10-point: 230g 8-point:190g 20-point: 345g
Agency Approvals	cUL , CE, UL

Discrete Inputs	
Current consumption	4mA @12VDC 3.2mA @24VDC 1.3mA @100-240VAC
Input Signal "OFF" Threshold	< 5VDC; < 40VAC
Input Signal "ON" Threshold	> 15VDC; > 79VAC
Input On delay	DC: 5ms 240VAC: 50ms 120VAC: 90ms
Input Off Delay	DC: 3ms 240VAC: 50ms 120VAC: 90ms
Transistor device compatibility	PNP, 3-wire device only
High Speed Input frequency	1kHz
Standard Input frequency	< 40 Hz
Required protection	Inverse voltage protection required
Analog Inputs	
Resolution	10 bit
Voltage Range acceptable	Analog input: 0-10VDC, 24VDC when used as discrete input
Input Signal "OFF" Threshold	< 5VDC (as 24VDC discreet input)
Input Signal "ON" Threshold	> 9.8VDC (as 24VDC discreet input)
Isolation	None
Short circuit protection	Yes
Total number available	A1-A8
Relay Outputs	
Contact material	Ag Alloy
Current rating	8A
HP rating	1/3HP@120V 1/2HP@250V
Maximum Load	Resistive: 8A/point Inductive: 4A/point
Maximum operating time	15ms (normal condition)
Life expectancy (rated load)	100k operations
Minimum load	16.7mA
Transistor Outputs	
PWM max. output frequency	0.5kHz (1ms on,1ms off)
Standard max. output frequency	100Hz
Voltage specification	10-28.8VDC
Current capacity	1A
Maximum Load	Resistive: 0.5A/point Inductive: 0.3A/point
Minimum Load	0.2mA

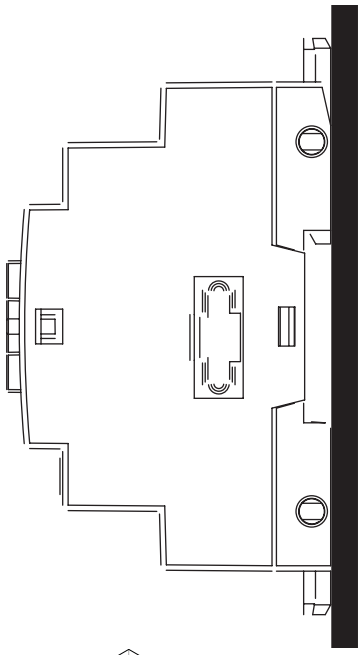
Product Specifications

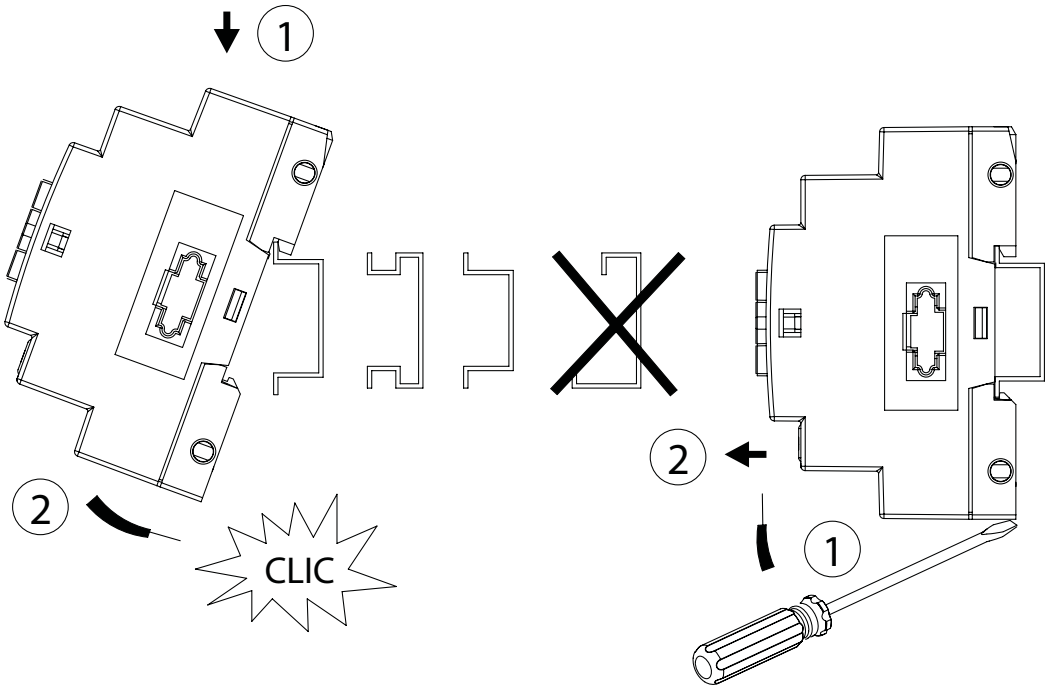
Part #	Input Power	Inputs	Outputs	Display	RS-485 Communications	Max I/O*
SG2-12HR-D	24 VDC	6 DC, 2 Analog	4 Relay	✓	N/A	36
SG2-12HT-D		6 DC, 2 Analog	4 Trans.	✓	N/A	36
SG2-20HR-D		8 DC, 4 Analog	8 Relay	✓	N/A	44
SG2-20HT-D		8 DC, 4 Analog	8 Trans.	✓	N/A	44
SG2-20VR-D		8 DC, 4 Analog	8 Relay	✓	Built-in MODBUS	44
SG2-20VT-D		8 DC, 4 Analog	8 Trans.	✓	Built-in MODBUS	44
SG2-10HR-A	85-240 VAC	6 AC	4 Relay	✓	N/A	34
SG2-20HR-A		12 AC	8 Relay	✓	N/A	44
Expansion Modules						
SG2-8ER-D	24VDC	4 DC	4 Relay	N/A	N/A	N/A
SG2-8ET-D		4 DC	4 Trans.	N/A	N/A	N/A
SG2-8ER-A	85-240VAC	4 AC	4 Relay	N/A	N/A	N/A
SG2-4AI	12-24 VDC	4 Analog	N/A	N/A	N/A	N/A
SG2-MODBUS	24 VDC	Communications Module, RS-485 MODBUS-RTU				
OEM "Blind" Models, No Keypad, No Display						
SG2-12KR-D	24VDC	6 DC, 2 Analog	4 Relay	X	N/A	12
SG2-20KR-D		8 DC, 4 Analog	8 Relay	X	N/A	20
SG2-10KR-A	85-240VAC	6 AC	4 Relay	X	N/A	10
SG2-20KR-A		12 AC	8 Relay	X	N/A	20
OEM "Bareboard" Models, No Keypad, No Display, No Expansion						
SG2-12CR-D	24VDC	6 DC, 2 Analog	4 Relay	X	N/A	12
SG2-20CR-D		8 DC, 4 Analog	8 Relay	X	N/A	20
SG2-10CR-A	85-240VAC	6 AC	4 Relay	X	N/A	10
SG2-20CR-A		12 AC	8 Relay	X	N/A	20
Accessories						
SG2-PL01	SG2 Programming Cable					
SG2-PM05	SG2 Memory cartridge					
SG2-SW	SG2 Programming software. Available on CD or FREE via download from Web					

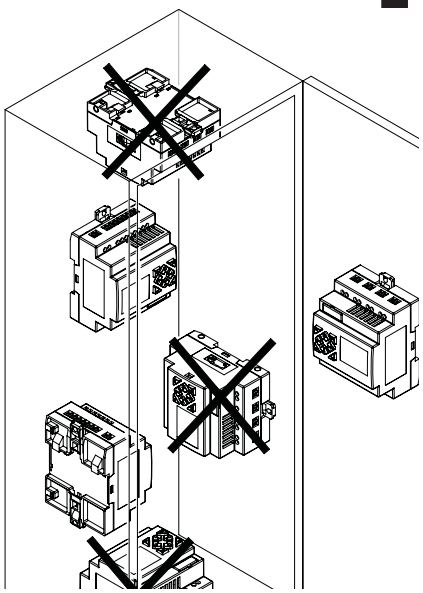
Mounting

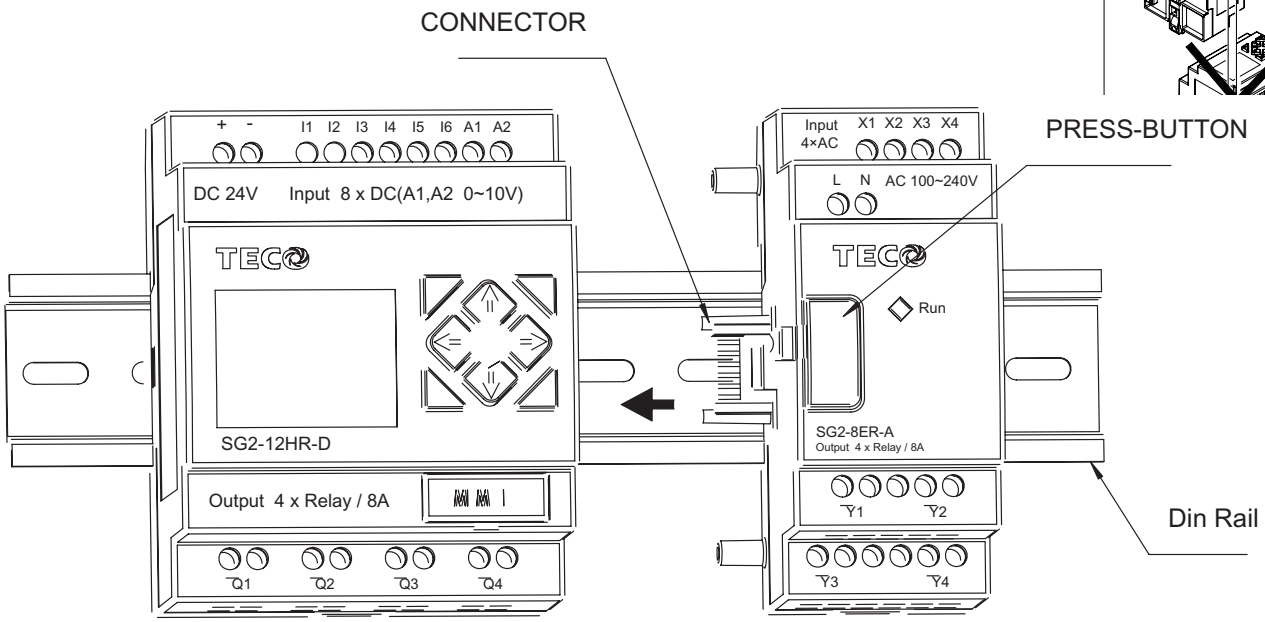
DIN-rail Mounting

The SG2 PLR should always be mounted vertically. Press the slots on the back of the SG2 and expansion module plug CONNECTOR onto the rail until the plastic clamps hold the rails in place. Then connect the expansion module and CONNECTOR with the Master (press the PRESS-BUTTON simultaneously)

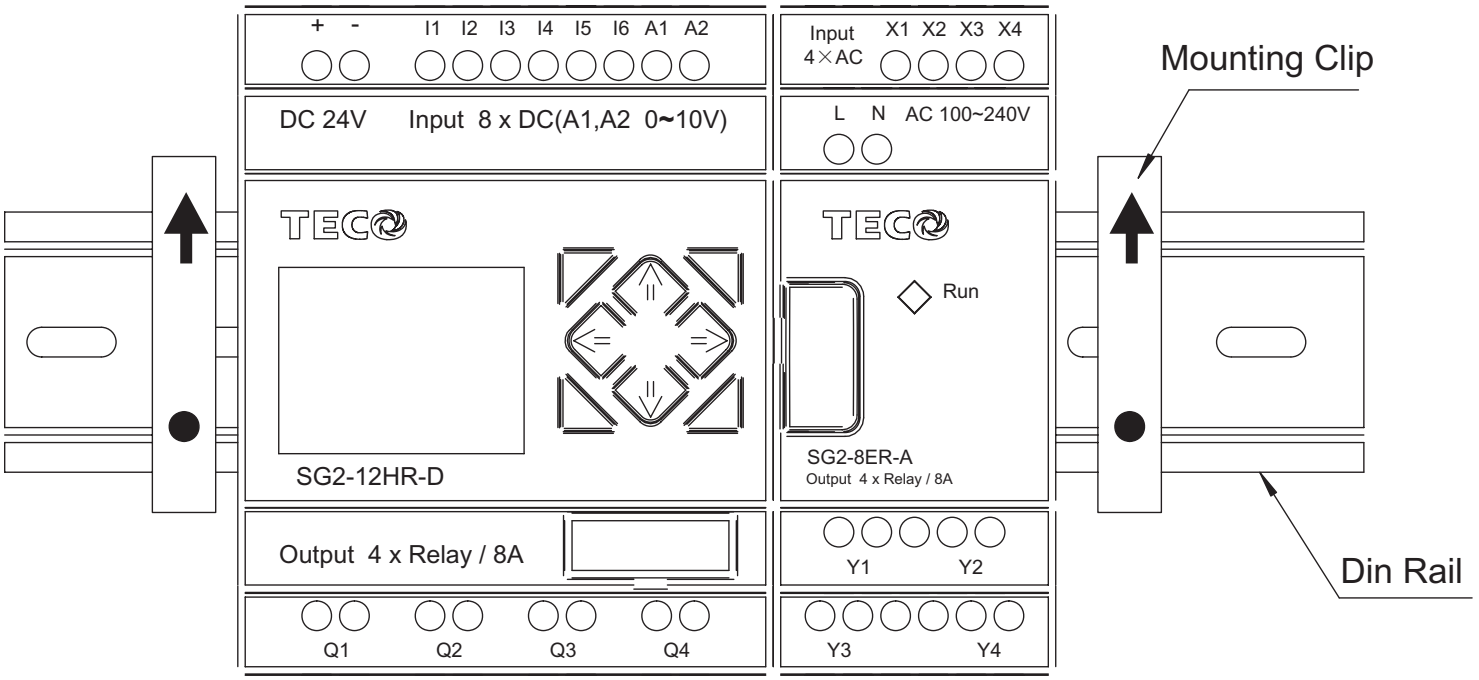








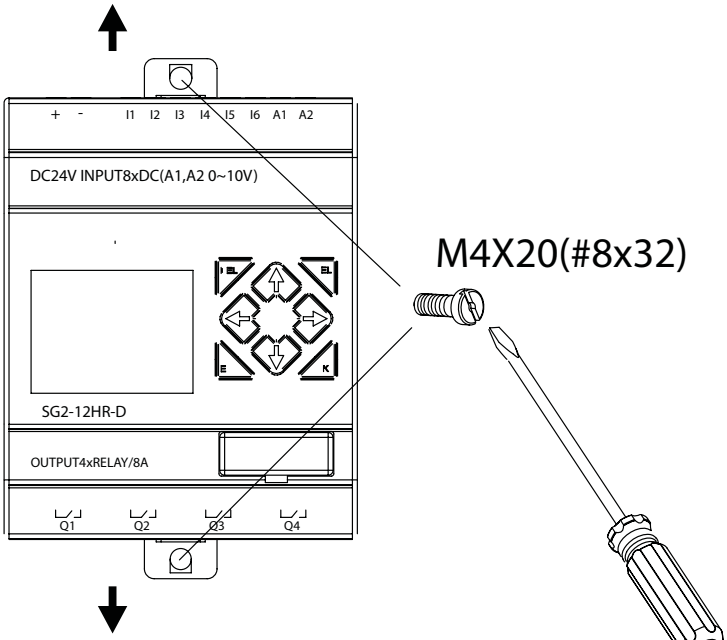
It is recommended to apply a DIN-rail end clamp to hold the SG2 in place.

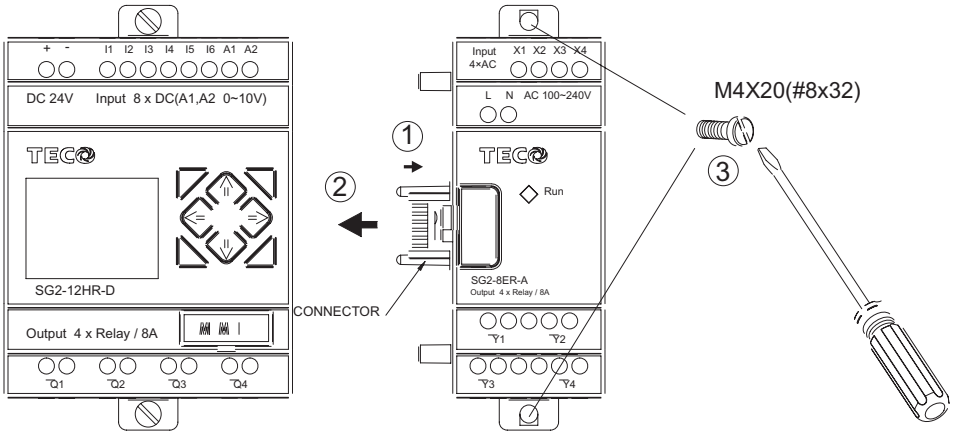


Direct Mounting

Use M4 screws to direct mount the SG2 as shown.

For direct installation of the expansion module, slide the expansion module and connect with the Master after the Master is fixed.





Wiring

WARNING: The I/O signal cables should not be routed parallel to the power cable, or in the same cable trays to avoid the signal interference.

To avoid a short circuit on the load side, it is recommended to connect a fuse between each output terminals and loads.

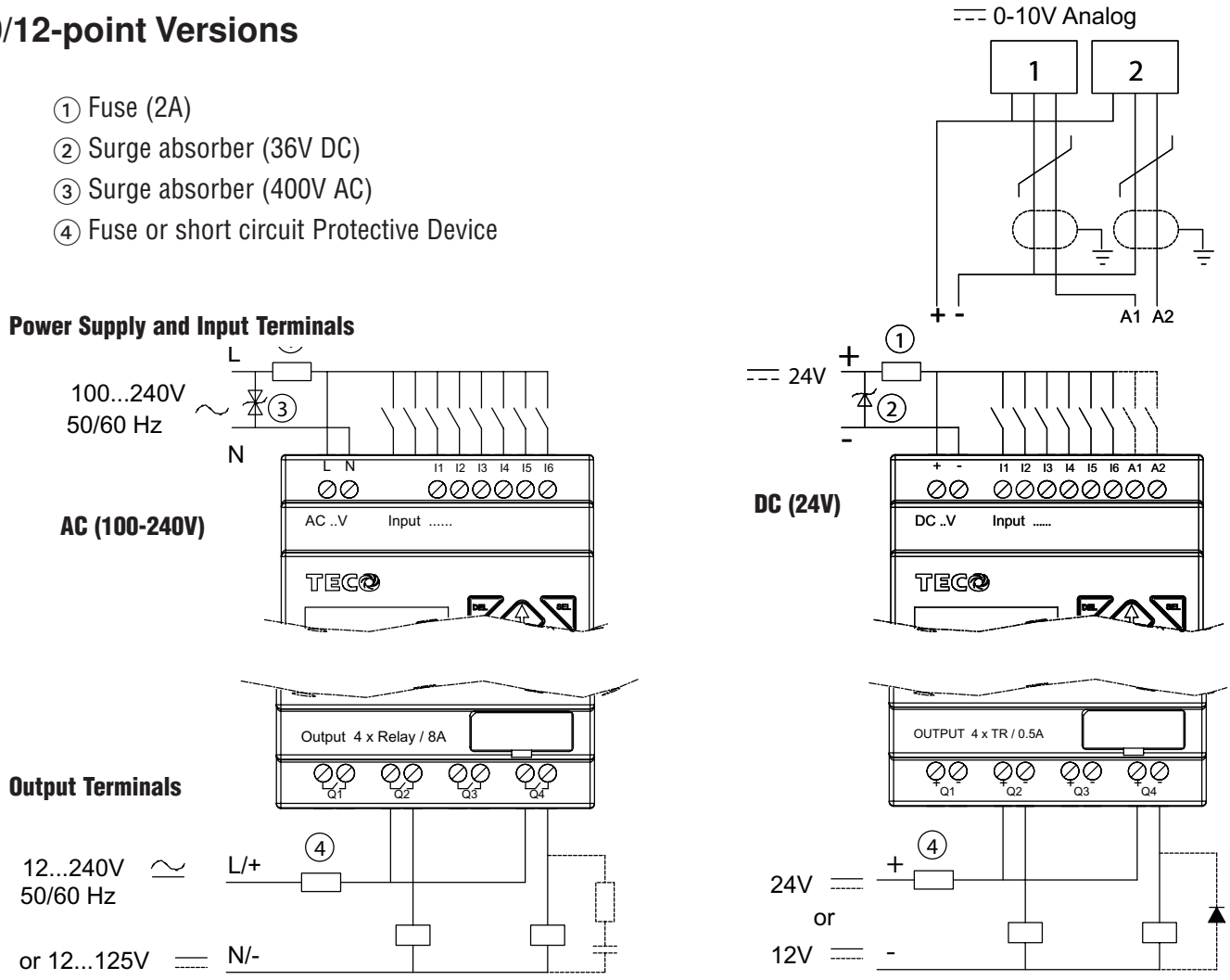
Wire size and Terminal Torque

mm^2	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

Ø3.5 (0.14in)	C	Nm	0.6
		lb-in	5.4

10/12-point Versions

① Fuse (2A)
② Surge absorber (36V DC)
③ Surge absorber (400V AC)
④ Fuse or short circuit Protective Device

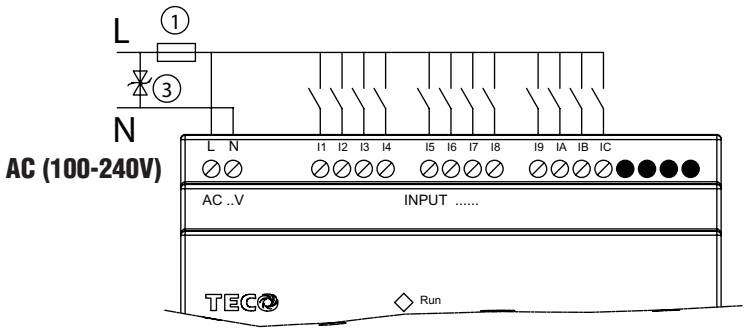


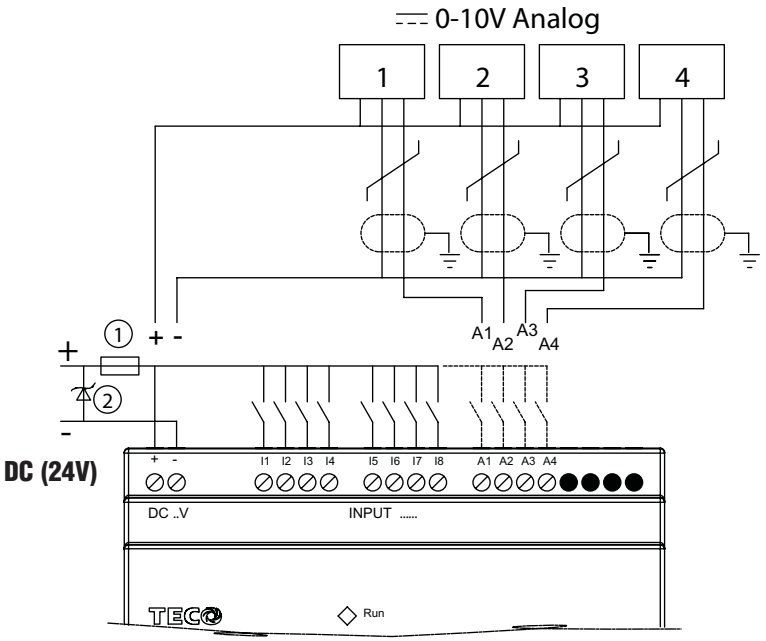
12...240V 50/60 Hz

20-point Versions

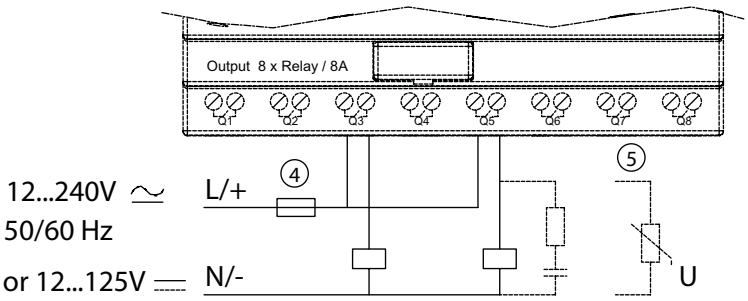
① Fuse (2A)
② Surge absorber (36V DC)
③ Surge absorber (400V AC)
④ Fuse or short circuit Protective Device

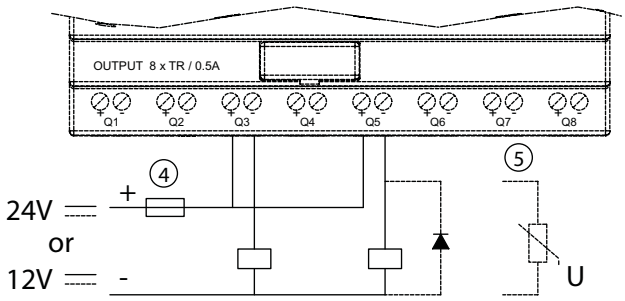
Power Supply and Input Terminals



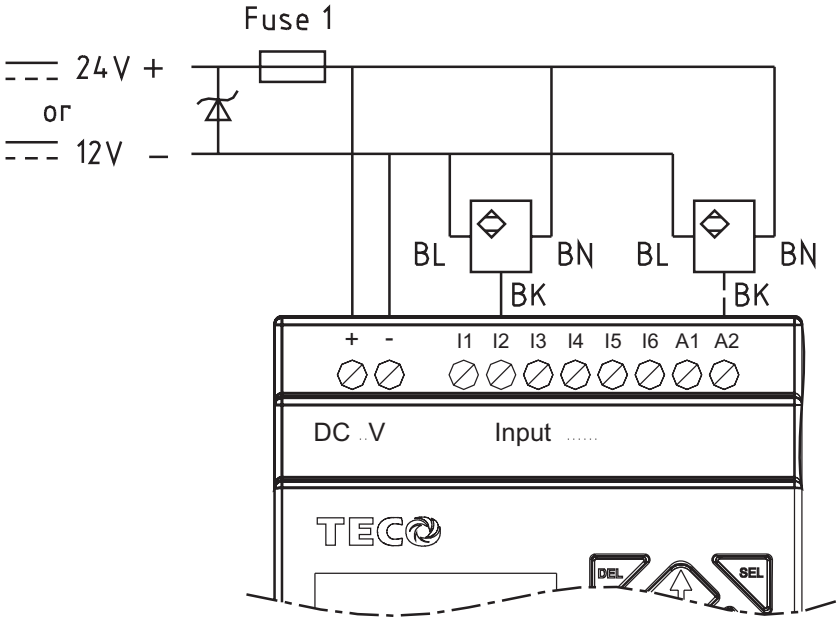


Output Terminals

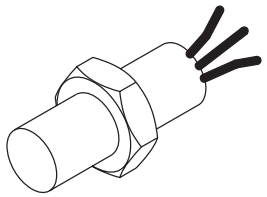




Sensor Connection

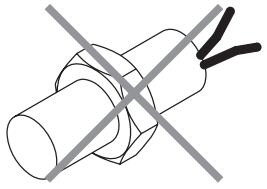


3-wire, PNP only



YES

2-wire



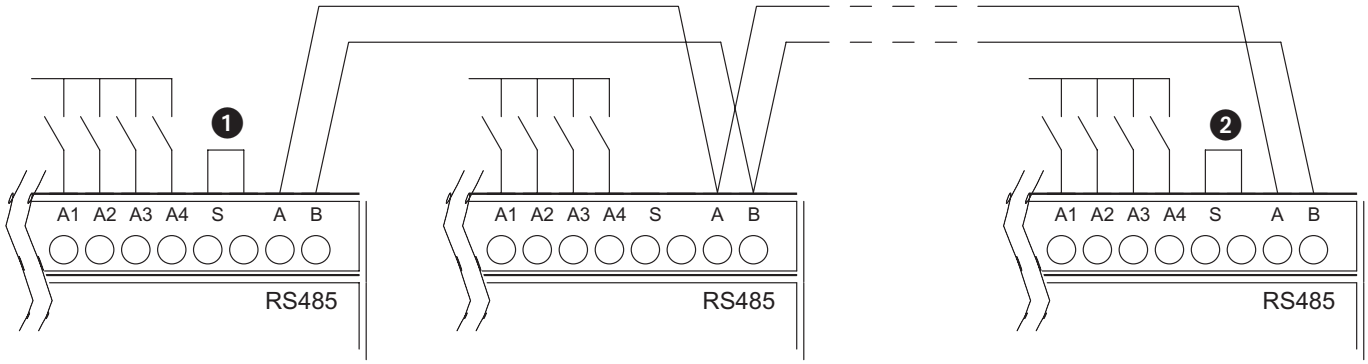
NO

DATA LINK OR REMOTE I/O LINK

① The power supply and the I/O supply should share the same power source.

② Only short circuit the first and the last module.

In accordance to EIA RS-485 standard, DATA LINK can connect Max.8 Modules (ID:1-8). REMOTE I/O can only connect 2 modules (MASTER & SLAVE).



Chapter 3: Program Tools

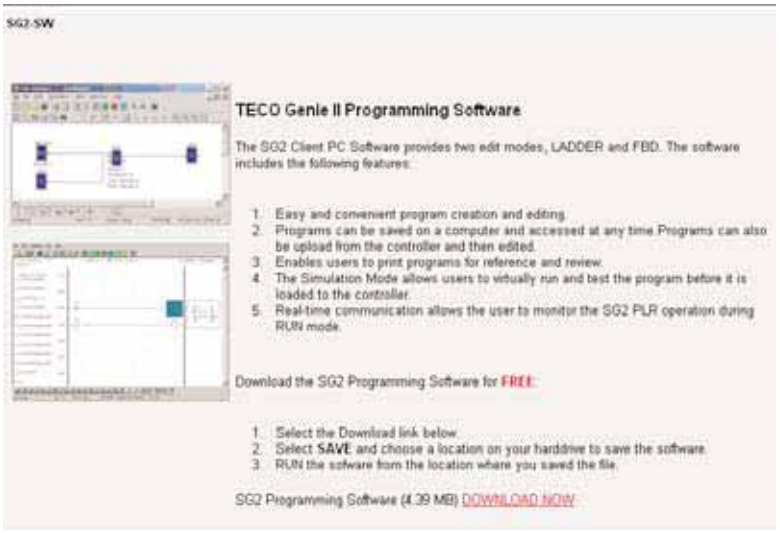
PC Programming Software "SG2 Client"

The SG2 Client programming software provides two edit modes, Ladder Logic and Function Block Diagram (FBD). The SG2 Client software includes the following features:

1. Easy and convenient program creation and editing.
2. Programs can be saved on a computer for archiving and reuse. Programs can also be uploaded directly from an SG2 and saved or edited.
3. Enables users to print programs for reference and review.
4. The Simulation Mode allows users to run and test their program before it is loaded to the controller.
5. Real-time communication allows the user to monitor and force I/O on the SG2 PLR operation during RUN mode.

Installing the Software

Install the SG2 Client Software from CD or from the free internet download at www.factorymation.com

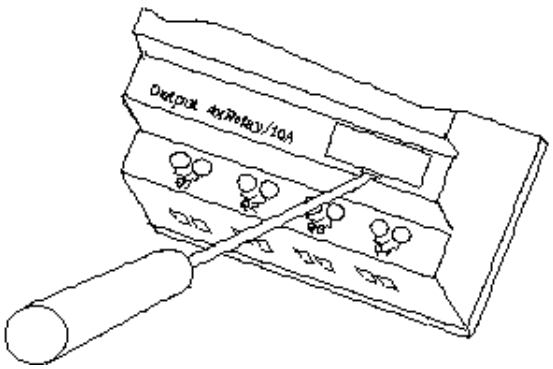


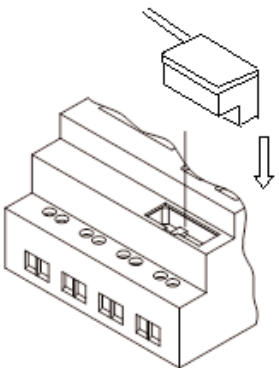
Connecting the Software

Remove the plastic connector cover from SG2 using a flathead screwdriver as shown in the figure below. Insert the plastic connector end of the programming cable into the SG2 PLR as shown in the figure below. Connect the opposite end of the cable to an RS232C serial port on the computer.

Start Screen

Run the SG2 Client software and the following Start screen will be displayed. From this screen, you can perform the following functions





New Ladder Program

Select File-->New-->New LAD to enter the development environment for a new Ladder program.

New FBD Program

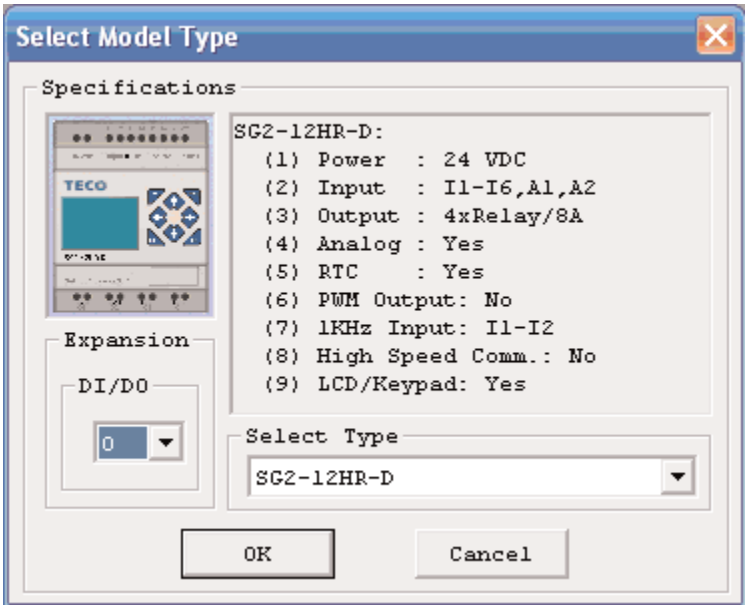
Select File-->New-->New FBD to enter the development environment for a new FBD (Function Block Diagram) program.

Open Existing File

Select File-->Open to choose the type of file to open (Ladder or FBD), and choose the desired program file, and then click Open.

Ladder Logic Programming Environment

The Ladder Logic Programming Environment includes all the functions for programming and testing the SG2 PLR using the Ladder Logic programming language. To begin a new program select File-->New--> and select the desired model of SG2, and the number of connected expansion units if applicable, as shown below.



Menus, Icons and Status Displays

The Ladder programming environment includes the following Menus, Icons and Status Displays

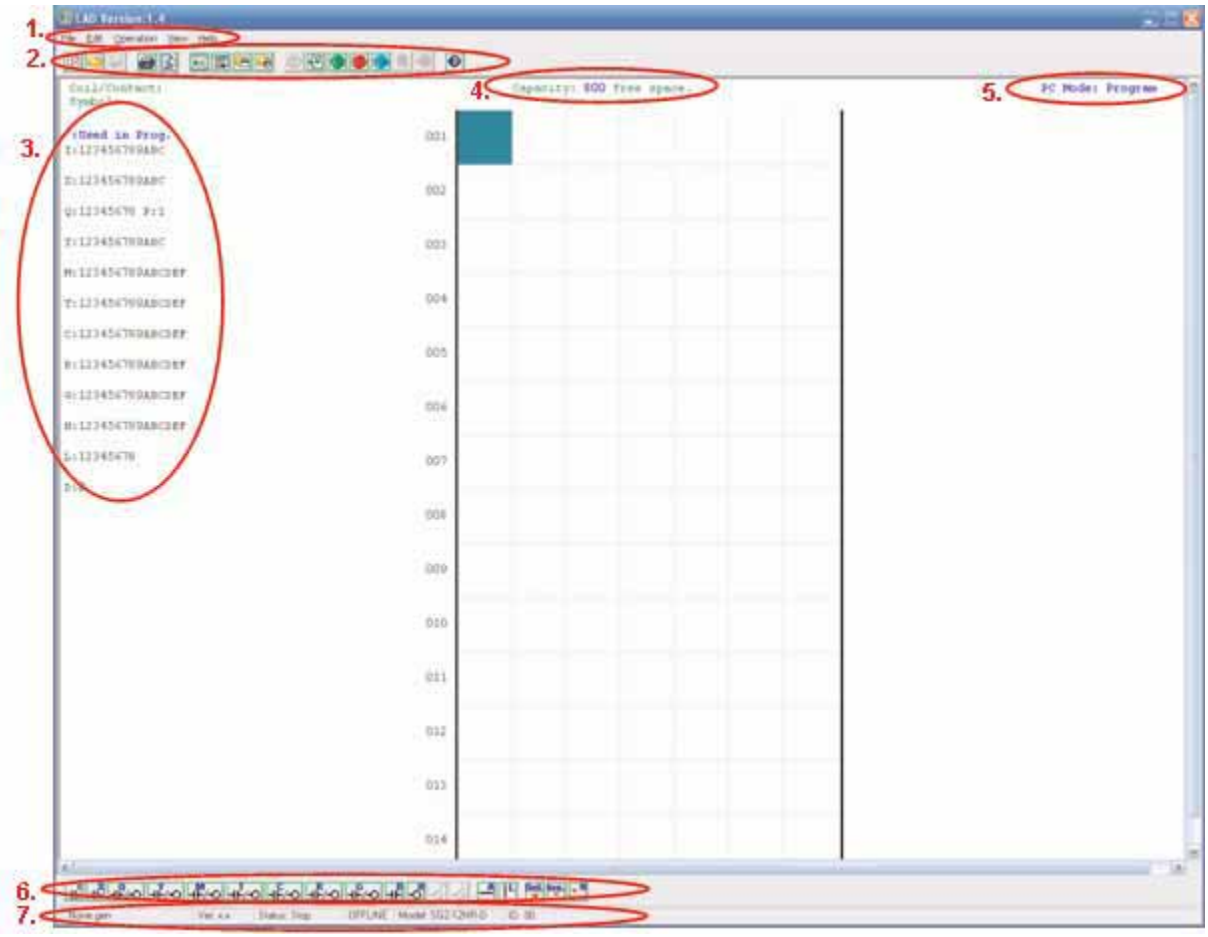
1. Menu bar – Five menu selections for program development and retrieval, editing, communication to connected controllers, configuration of special functions and viewing preference selections.
2. Main Toolbar – (From Left to Right)

Icons for a New program, opening a program, and printing

Icons for Keypad, Ladder view, HMI/Text editing and Symbol (comments) editing.

Icons for Monitor, Simulator, Controller Mode changes (Run, Stop, and Quit), and Read/Write programs to/from the PLR.

3. Usage List – List for all memory types and addresses used with the current open program. Used addresses are designated by a "*" symbol below each address.
4. Amount of free programming memory available.
5. Current Mode – operation mode of the controller, or simulator, from the connected PC.
6. Ladder Toolbar – Icons for selecting and entering all available Ladder Logic instructions.
7. Status Bar – Status of current open project and connected PLR.



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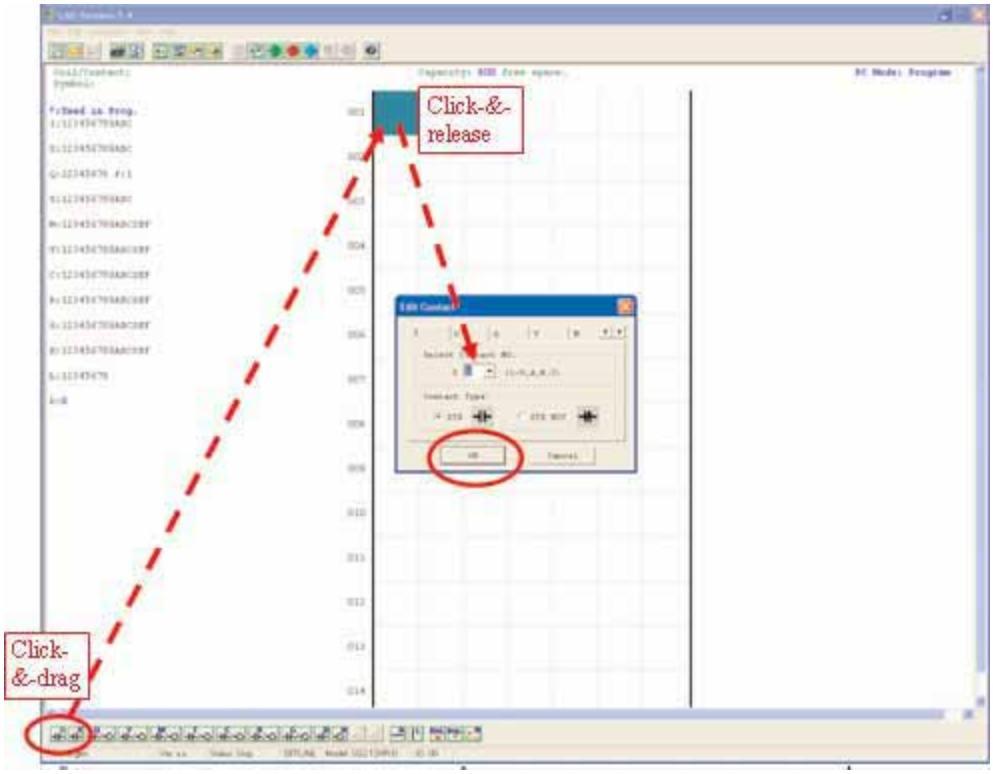
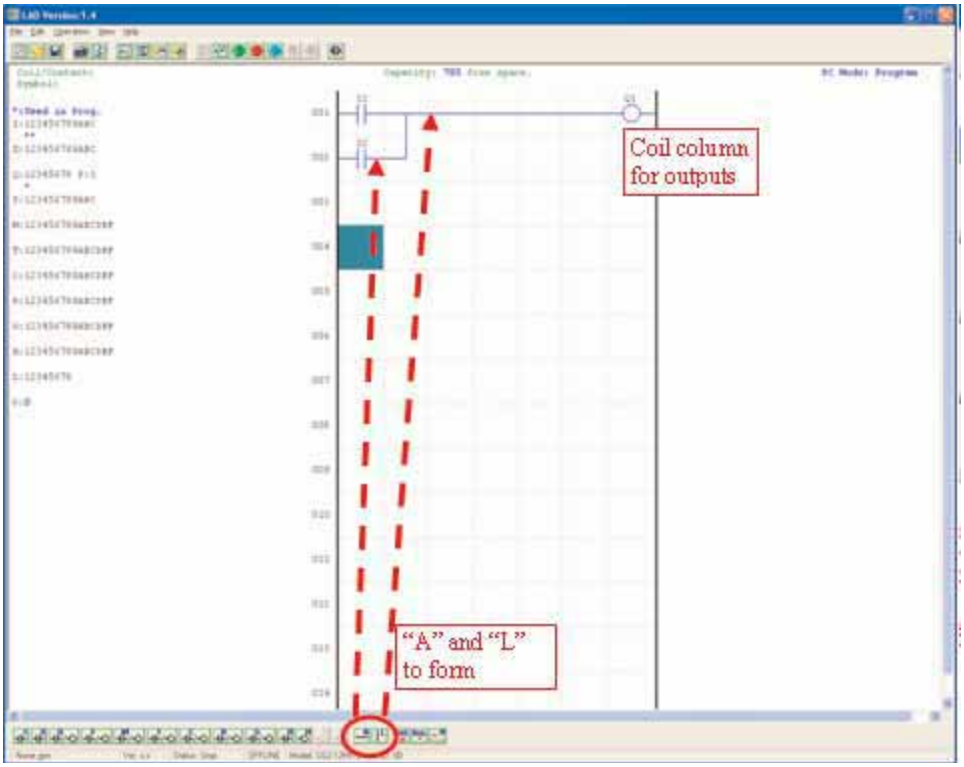
Programming

The SG2 Client software can be programmed by either drag-and-drop of instructions or by using keyboard entry commands. Below is an example of some common methods of entering programming instructions.

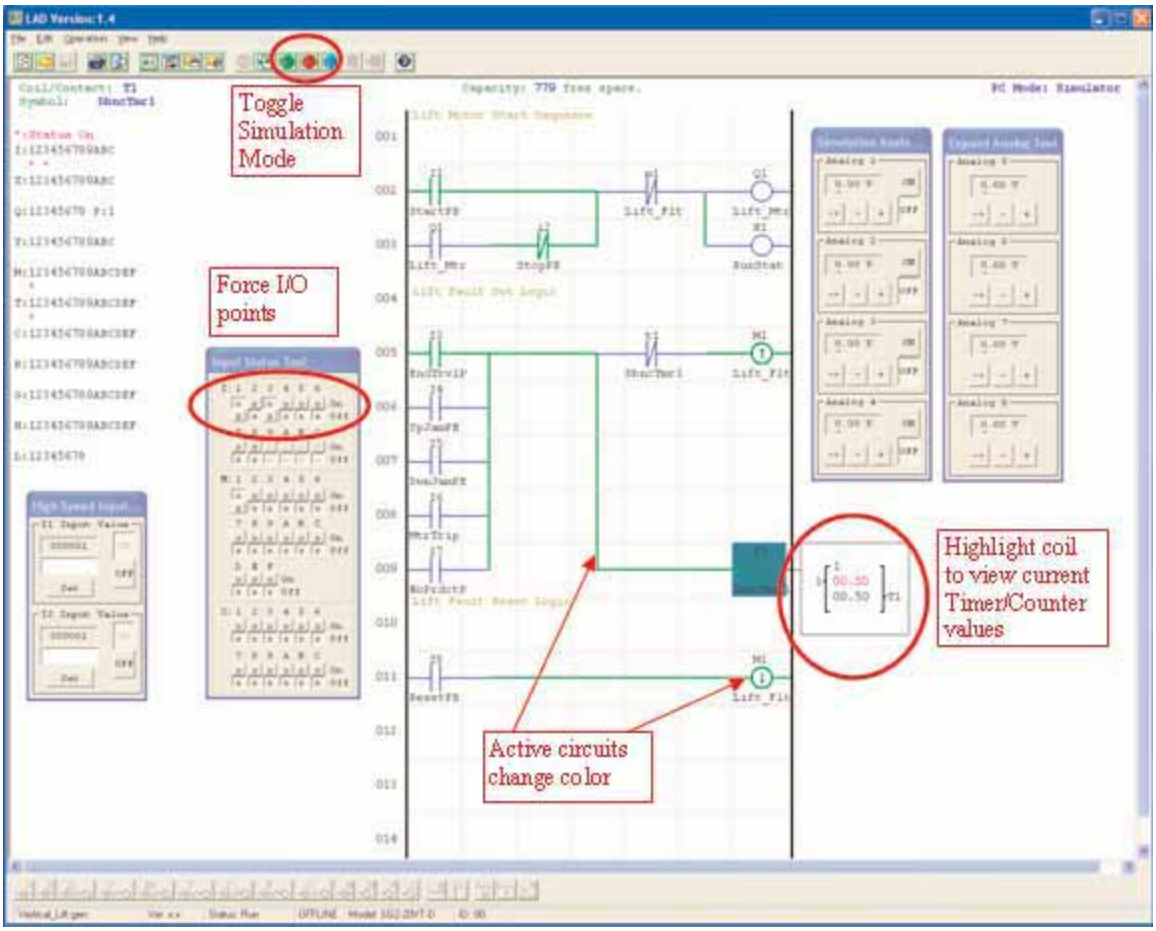


The “A” and “L” keys or icons are used to complete parallel and serial circuits. The rightmost column is for output coils.



Simulation Mode

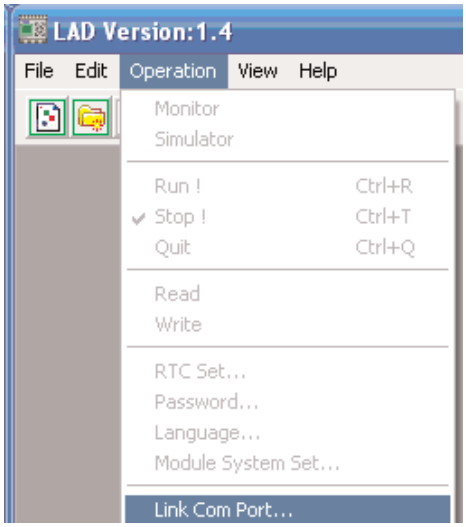
The SG2 Client software includes a built-in simulator to test and debug programs easily without the need for downloading to a controller. To activate simulation mode, simply press the red RUN icon. The program below is shown in simulation mode, identifying the significant available features.



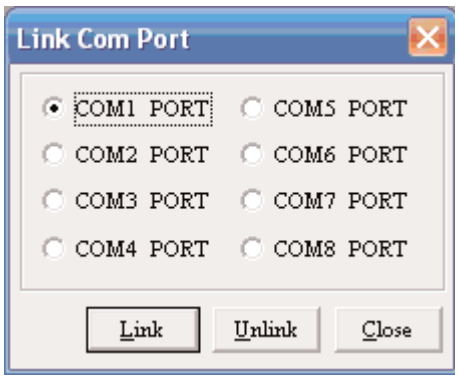
Establish Communication

The following is the simple procedure for establishing communication between the connected PC and the SG2 PLR.

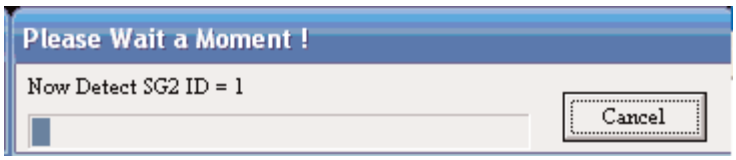
a. Select “Operation/Link Com Port…” as shown below.



b. Select the correct Com Port number where the programming cable is connected to the computer then press the “Link” button.

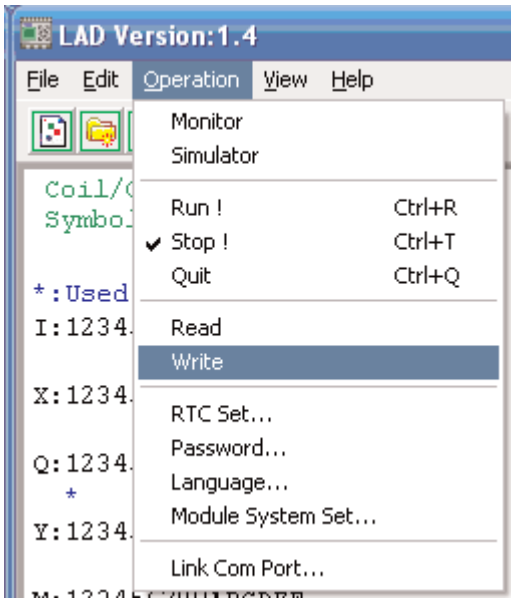


c. The SG2 Client software will then begin to detect the connected PLR to complete it’s connection as shown below.



Writing Program to PLR

From the Operation menu, select the Write function and write the program to the connected PLR as shown below.



Operation menu

The Operation menu, includes several system configuration functions for both online and offline setup. The following explains the details of each function.

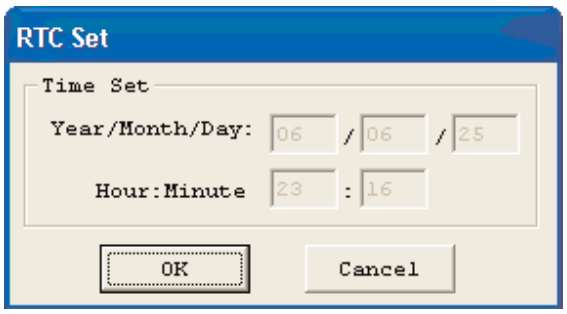
Monitor – Online function for runtime monitor and editing when connected to a controller

Simulator – Offline function for testing and debugging a program.

Run-Stop-Quit – Mode change selections for both runtime editing and simulation mode.

Read-Write – Reading and writing programs to and from a connected PLR.

RTC Set – Online function for setup of the Real-time clock/calendar (see dialog below)



Password – Set a password for accessing the current program after upload to the PLR

Language – Change software language

Module System Set – Dialog for changing important system setup functions including Module ID, Remote I/O preferences, Expansion I/O settings, and Retentive memory preferences (Keeping) for (C) Counters, (M) Auxiliary Coils, and the LCD Backlight.

Online Monitoring/Editing

The SG2 Client software allows for online monitoring of the currently running program during runtime. Additional online functions include, I/O forcing, and Mode changes (Run/Stop/Quit).

Note: The SG2 Client software does not support runtime logic editing changes. All logic edits to contacts, coils, timers/counters, and circuit connecting lines must be written to the connected PLR while in Stop mode.