Parsmega
industrial automation

User Manual

Thyristor controller

PM-SCR11



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Contents

1 INTRODUCTION 4

1.1 The purpose of the manual 4

1.3 Manual validation 4

1.4 Technical Support 4

2 SAFETY TIPS 4

3 DESCRIPTION 5

3.1 Basic description 5

3.2 Module Uses 5

3.3 Technical Specifications 5

4 INSTALLATION 6

4.1 Observe EMC items 6

4.2 Cases that cause system malfunctions 6

4.3 Things to consider 6

5 CONNECTIONS 7

5.1 Grouping of connections 7

5.2 Power connection 8

5.3 Digital inputs and outputs communication 8

5.4 Output connections 8

5.5 Thyristor connection 10

5.6 Isolated RS485 connection 11

5.7 Connecting the mains voltage 11

6 PARAMETERS 11

6.1 Communications Parameter 12

6.2 Module information parameter 13

6.3 Input status parameter and outputs 13

6.4 Welding settings parameter 14

6.5 Double welding machine 16

6.6 Commands 17

7 CONTROLLER MODULE SETTINGS COMPUTER SOFTWARE 19

7.1 Introduction 19

7.2 The main page of the program 21

1 Introduction

1.1 The purpose of the manual

This manual contains all the information needed to set up, install, wiring and communicate with the PM-SCR11 module.

1.2 Technical knowledge required

In order to understand this booklet, a basic acquaintance with electrical topics is required.

1.3 Manual validation

This booklet is valid for this specification.

MODEL	Hardware	Software
PM-SCR11	V1.0	V1.1

1.4 Technical Support

To get technical support through the following contact:

- Email: **info@parsmega.com**
- Phone: **+98 21 91009955**
- WhatsApp: **+98 9981122566**

2 safety tips

- Starting the module by non-experts and ignoring the commands may cause serious damage to the module.
- This module does not directly pose a risk to human life.
- The use of this module is not approved for use in life-threatening devices.

3 Description

3.1 Basic description

PM-SCR11 is a versatile and flexible thyristor controller that has the ability to control thyristor output power.
This module has the ability to connect to a computer and control equipment such as (HMI and PLC).

3.2 Module Uses

This module is a very suitable option for applications that need power control by thyristor. Such as:

- Resistance welding devices
- Controller of industrial heaters
- Universal engine speed control
- And all the devices that need power control by thyristor.

3.3 Technical Specifications

- RS485 serial communication capability, MODBUS protocol support
- Wide range of port 485 baud rate (from 2400 to 230400)
- Display (LED) serial communication status
- Power control with high precision 1%
- Two-stage working mode for welding machines
- Working mode controlled by PLC
- Ability to save 1 double welding program
- Analog input
- Ability to gradually increase power (to prevent sparks)
- The working temperature range is -30 ~ +50 degrees Celsius

4 Installation

4.1 Observe EMC items

This product is designed and manufactured to work in industrial environments. However, for proper operation, you should check and eliminate the issues that cause the module to malfunction.

4.2 Cases that cause system malfunctions

- Direct exposure to strong electromagnetic field
- high humidity

4.3 Things to consider

4.3.1 Convenient ground connection

• When installing the module on the panel body, make sure that the panel body is connected to the ground.

• All ineffective metal parts are (firmly) grounded.

• When connecting varnished wires to ground connection, remove the varnish from that part.

4.3.2 Appropriate wiring method

• Divide your system cables into different groups (high voltage, power supply, and signal, analog).

• Always transfer the power cable from another duct.

• Always place your analog cables close to the body of the panel and rails (which are grounded).

4.3.3 Cable shield connection

• Make sure the shields are properly grounded.

• Try to keep a small part of the cable without a shield.

5 connections

All the connections of this module are screws



5.1 Grouping of connections

The connections of this module include 6 main groups:

- Power
- Digital input
- Digital output
- RS485 serial
- Analog input
- Gate thyristors output

5.2 Power connection

The proper power supply for this module is 24 v dc.

- Terminal 1: 0 v
- Terminal 2: + 24 v

5.3 Digital inputs and outputs communication

This module has 1 digital input as follows

Label	Application
IN	Digital input
COM+	Common digital input and output

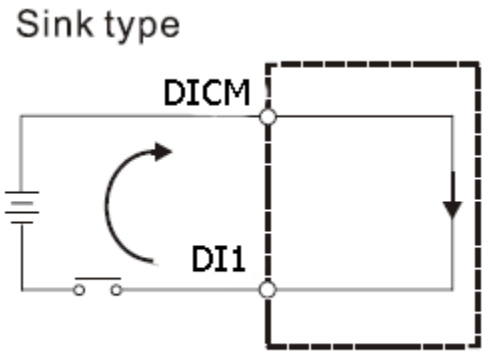
- To activate the digital input, a voltage level of 18 to 24 volts is needed.
- Digital inputs have different functions in different working modes, which will be discussed further.
- To activate an input, a pulse with a minimum time of 100 milliseconds is required.

The wiring method is as follows:

❖ Sink mode(low active)

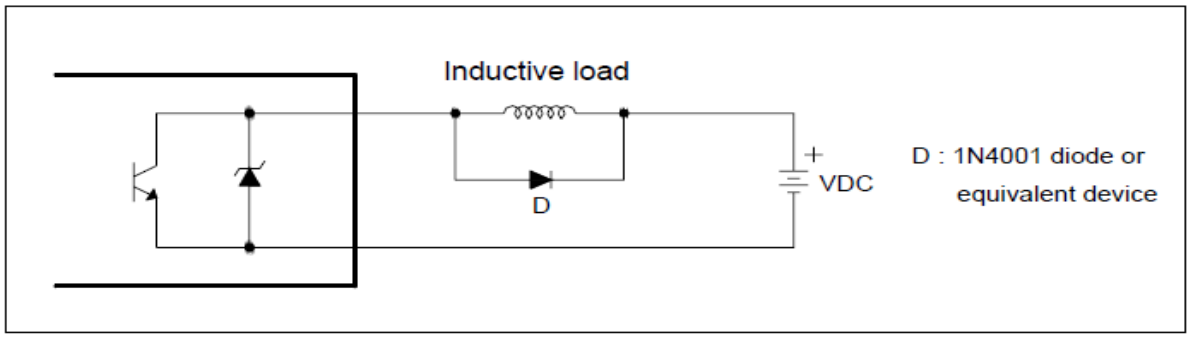
5.4 Output connections

This module has 1 digital output as follows

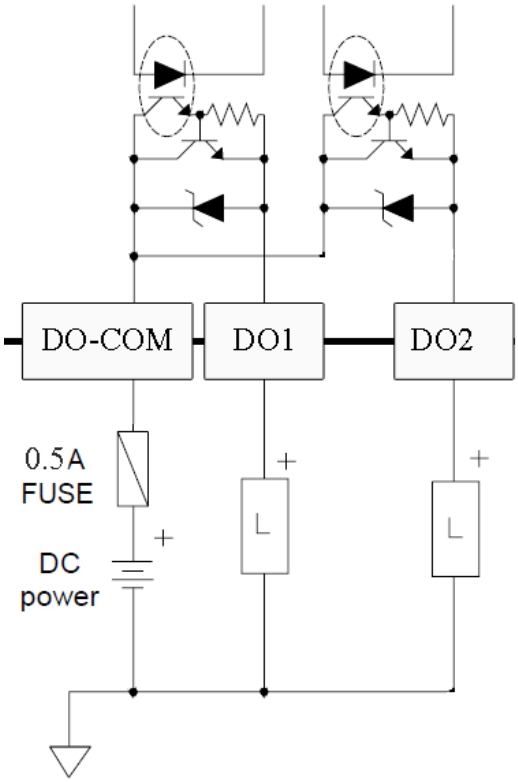


Label	Application
OUT	Digital output
COM+	Common digital input and output

- The output voltage range is between 5 and 30 V DC and the maximum current is 200 mA.
- **Attention**, in case of using **selfie load** (for example, relay coil) in digital output, freewheeling diode **must be** used.
- The digital output in this product is the Zero Cross signal, this signal can be used to coordinate the PLC program with the grid power frequency if needed.



How to wire digital outputs

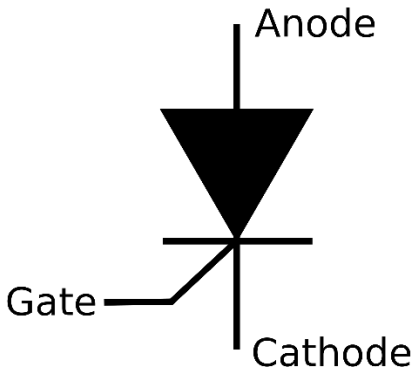


- Note that the above output is a SOURCE digital output (it can only connect and disconnect the positive voltage).

5.5 Thyristor connection

Label	Function
G1	Gate thyristor 1
K1	Cathode thyristor 1
G2	Gate thyristor 2
K2	Cathode thyristor 2

The figure below is the technical view of a thyristor



5.6 Isolated RS485 connection

This module is equipped with an isolated RS485 serial port on which the MODBUS RTU protocol is implemented.

Label	Function
D+	Positive data
D-	Negative data

5.7 Connecting the mains voltage

The module needs to sample the network voltage to be synchronized with the power grid, for this purpose, the voltage connected to the load should be connected to the L1 and L2 inputs.

Note: In a single-phase network, neutral and phase must be connected to these inputs, and in a three-phase network, two phases that feed the load must be connected to these inputs.

Label	Function
L1	Grid electricity
L2	Grid electricity

6 parameters

- All parameters are set with default values at the time of purchase.
- You can also do this with the command (Reset to factory setting).

- For ease of work, the parameters are divided into different groups.
- The length of all variables is word
- If the save command is not sent after making changes to the parameters, the previous values will be valid after the device is turned off and on.
- RS485 network parameters need to be restarted to apply changes.

6.1 Communications Parameter

Title	Variable Type	the length	Address			Description	Default	Read/write
			Dec	Hex				
Device ID	Unsigned int	1	0	0	40001	DeviceID ID 1~247	1	R/W
Baud Rate	Unsigned int	1	1	1	40002	Data transfer speed 0~10 0 = 2400 bps 1 = 4800 bps 2 = 9600 bps 3 = 14400 bps 4 = 19200 bps 5 = 28800 bps 6 = 38400 bps 7 = 56700 bps 8 = 76800 bps 9 = 115200 bps 10 = 230400 bps	2	R/W
parity	Unsigned int	1	2	2	40003	0~2 0=none 1=odd2=even	2	R/W
Stop bit	Unsigned int	1	3	3	40004	0, 1 0=1 1=2	0	R/W
Reserve	Unsigned int	1	4	4	40005	-	-	-

Note that the system must be reset once to apply the above parameters.

6.2 Module information parameter

- All the following parameters are read only .

Title	Variable type	the length	Address			Description	Default	Read/write
			Dec	Hex				
Firmware ver	Float	2	5	5	40006	-	-	R
Hardware ver	Float	2	7	7	40008	-	-	R
Model	Unsigned int	1	9	9	40010	-	-	R
Serial number	Unsigned long	2	10	A	40011	-	-	R

6.3 Input status parameter and outputs

Title	Variable type	the length	Address			Description	Default	Read/write
			Dec	Hex				
Digital inputs	Unsigned int	1	14	E	40015	-	-	R
Digital outputs	Unsigned int	1	15	F	40016	-	-	R
Model	Unsigned int	1	9	9	40010	-	-	R
Serial number	Unsigned long	2	10	A	40011	-	-	R

- The first input is in the LSB .
- The first output is in the LSB .

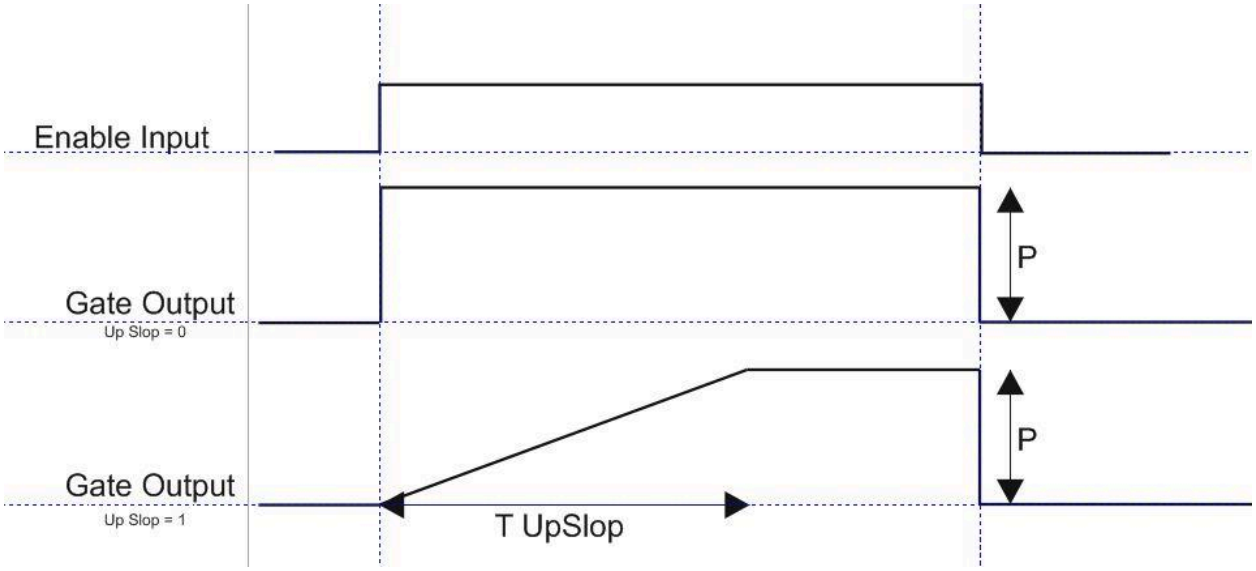
6.4 Welding settings parameter

Title	Variable type	the length	Address			Description	Default	Read/write
			Dec	Hex				
Welder mode	Unsigned int	1	25	19	40026	0~1 0=PLC Control 1=Double Weld	0	R/W
Source selection	Unsigned int	1	26	1A	40027	0~2 0=Analog in 1=Serial Value 2=Fixed Value	0	R/W
analog value	Unsigned int	1	27	1B	40028	0~100%	-	R
Serial value	Unsigned int	1	28	1C	40029	0~100%	0	R/W
Constant	Unsigned int	1	29	1D	40030	0~100%	0	R/W
Maximum power limiter	Unsigned int	1	30	1E	40031	0~100%	100	R/W
RESERVE	Unsigned int	1	31	1F	40032	-	-	-
RESERVE	Unsigned int	1	32	20	40033	-	-	-
Ad y /sh y b	Unsigned int	1	33	21	40034	0~1 0=Normal 1 = Up Slope	0	R/W
Time of the object b	Unsigned int	1	34	22	40035	Millisecond Ms	0	R/W
RESERVE	Unsigned int	1	35	23	40036	-	-	-
RESERVE	Unsigned int	1	36	24	40037	-	-	-
RESERVE	Unsigned int	1	37	25	40038	-	-	-
Analog type Input	Unsigned int	1	38	26	40039	0~1 0=0~10V 1=4~20mA	0	R/W

• Source selection selects the amount of output power of the thyristors from "input analog value", "serial value" or "fixed value".

• All values related to output power are in percentage.

The following describes how to operate in PLC Control mode. This mode can be selected by register 40035.



P: output power T Upslop: slope duration

Explanation: In PLC Controlled mode, after selecting the source of power calculation by register 40025, the gate outputs are turned on due to the activation of the Enable input and remain on until the Enable input is active.

If the normal/slope register has a value of 1, the output starts to rise with the slope set in register 40033.

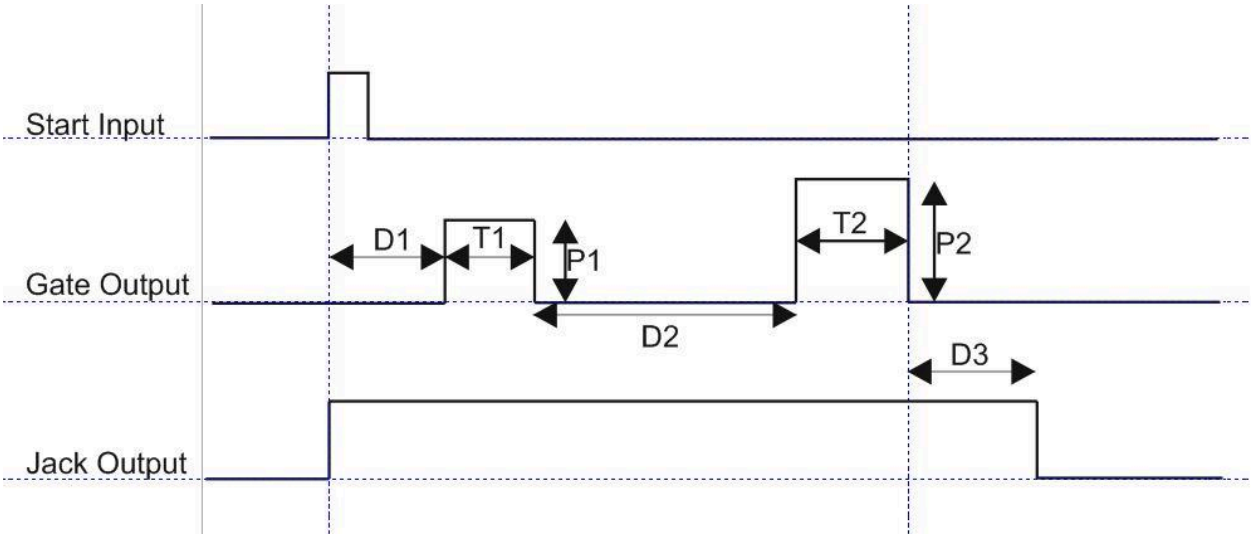
6.5 Double welding machine

These parameters are for use in welding machines without PLC.

Title	Variable Type	the length	Address			Description	Default	Read/write
			Dec	Hex				
Boil before _ boiling	Unsigned int	1	41	29	400 42	unit = cycle	0	R/W
Boiling time 1	Unsigned int	1	42	2A	400 43	unit = cycle	0	R/W
Welding power 1	Unsigned int	1	43	2B	40044	0~100%	0	R/W
After welding 1 _	Unsigned int	1	44	2C	400 45	unit = cycle	0	R/W
Boiling time 2	Unsigned int	1	45	2D	40046	unit = cycle	0	R/W
welding power 2	Unsigned int	1	46	2E	400 47	0~100%	0	R/W
After welding 2 _	Unsigned int	1	47	2F	400 48	unit = cycle	0	R/W

• Power values in double welding are not limited by the power limiting register (40029).

In the following figure, the performance of the double welding module is shown:



D1: pre-weld delay 1

D2: post-weld delay 1/pre-weld delay 2

T1: Boiling time 1

T2: Boiling time 2

P1: welding power 1

P2: welding power 2

D3: Delay after weld 2

6.6 Commands

All commands are written in a register, the specifications of that register are as follows.

All commands will be executed after 500 milliseconds at most.

Title	Variable type	the length	Address	Dec	Ability to write	Description	Default
Command register	Unsigned int	1	40040	39	W	-	-

The list of commands is as follows

No	Function	code
1	Save SettingsSave settings	1
2	Save Welding ProfileSave double weld settings	2
3	Reset	20

All values are in decimal

Number 1: Save Setting

Note that all your settings on the parameters are on the module's temporary memory, and in order to transfer these settings to the retentive memory, you must use the Save Setting command. For this purpose, you must send 1 decimal number to the address 40040.

Number 2: Save double welding settings (Save Welding Profile)

With this command, the current values of the double welding settings are transferred to the non-volatile memory.

Note: If these values are not changed, they will always have the saved values after turning on.

Number 3: Reset command

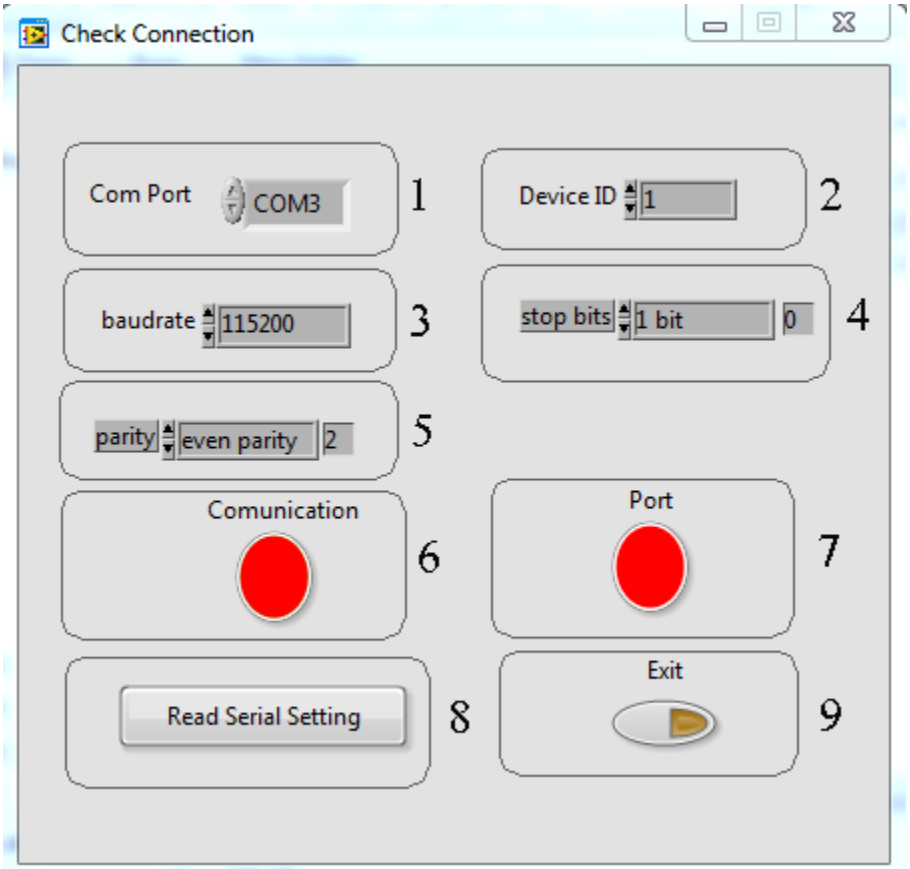
When you need to reset the module, you can send this command to the instruction register. After sending this command, the complete reset will be done 2 seconds later. During these 2 seconds, the system will not perform any operation.

7 Controller module settings computer software

In order to configure and monitor the controller, a computer program has been prepared by Pars Mega Company, which includes all the features of the controller.

7.1 Introduction

By running the program, the following page will open at first:



Number 1: It is the serial port number to which the controller module is connected.

When the correct port is selected, the indicator number 7 will turn green.

Number 2: is the ID of the controller, which is 1 by default.

Number 3: The serial communication baud rate is 9600 by default.

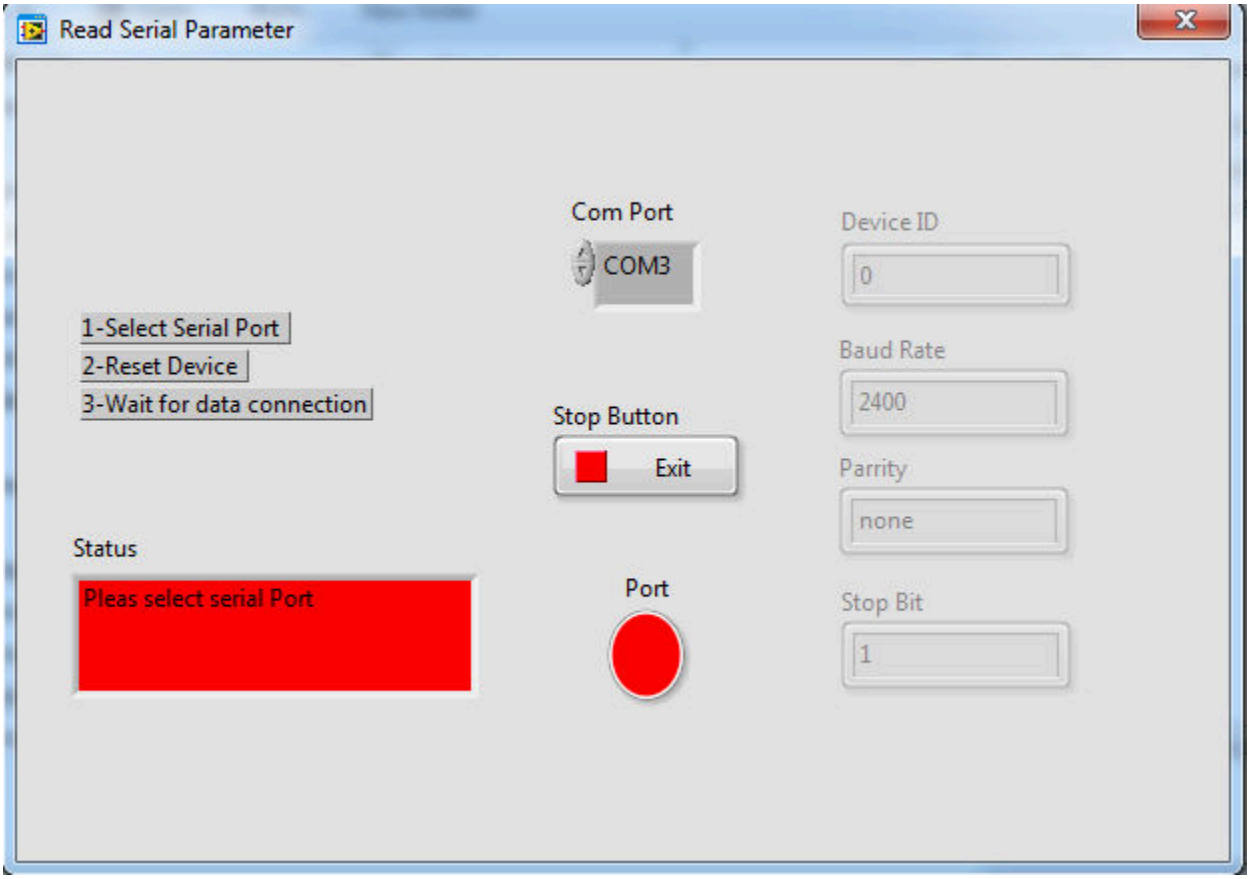
Number 4: The Stop bit specifier is in serial communication and is 1 bit by default.

Number 5: It specifies the parity of serial communication and it is even by default.

Number 6: When the connection is established, this indicator will turn green and this page will be closed automatically and the main page of the program will be opened.

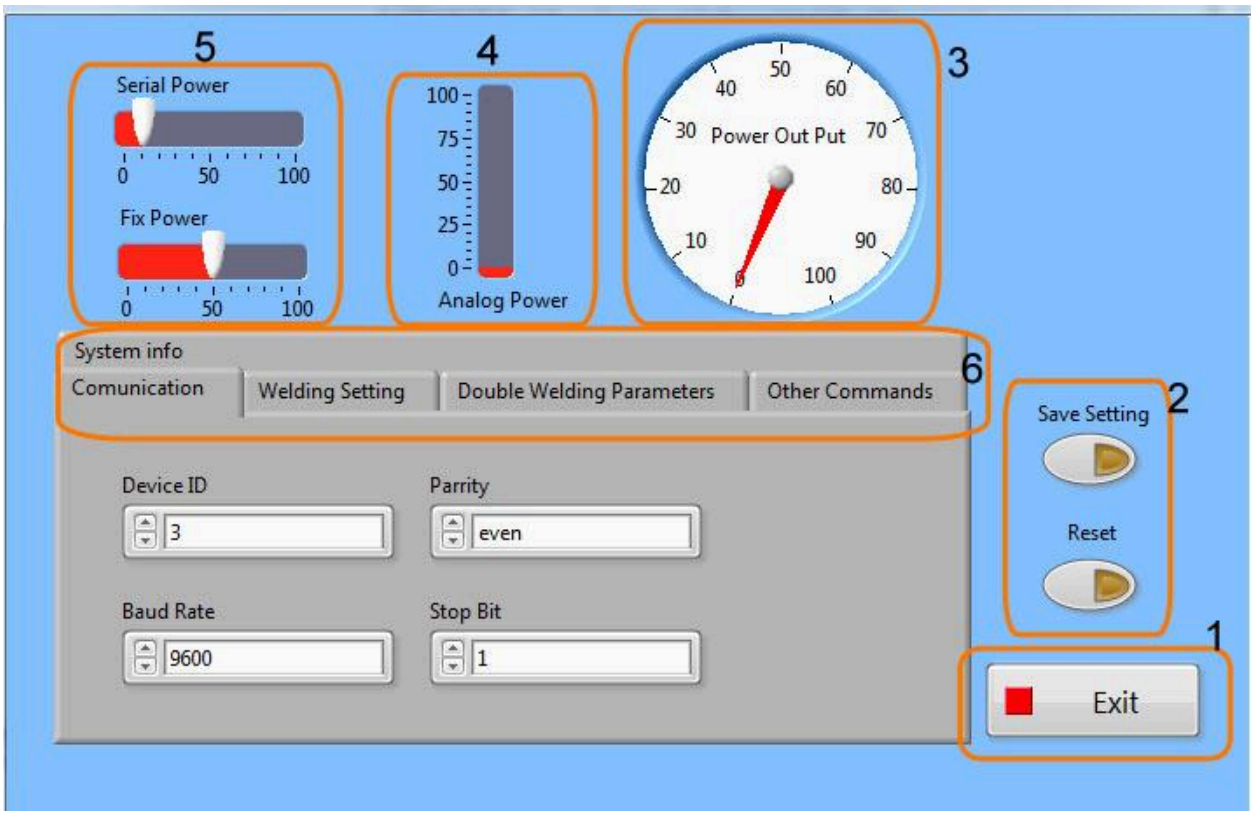
Number 7: indicates the status of the selected port: red color for error and green color for no error

Number 8: If you don't know what settings are on the device and communication is not established, press this button to go to another page where it is possible to read these parameters.



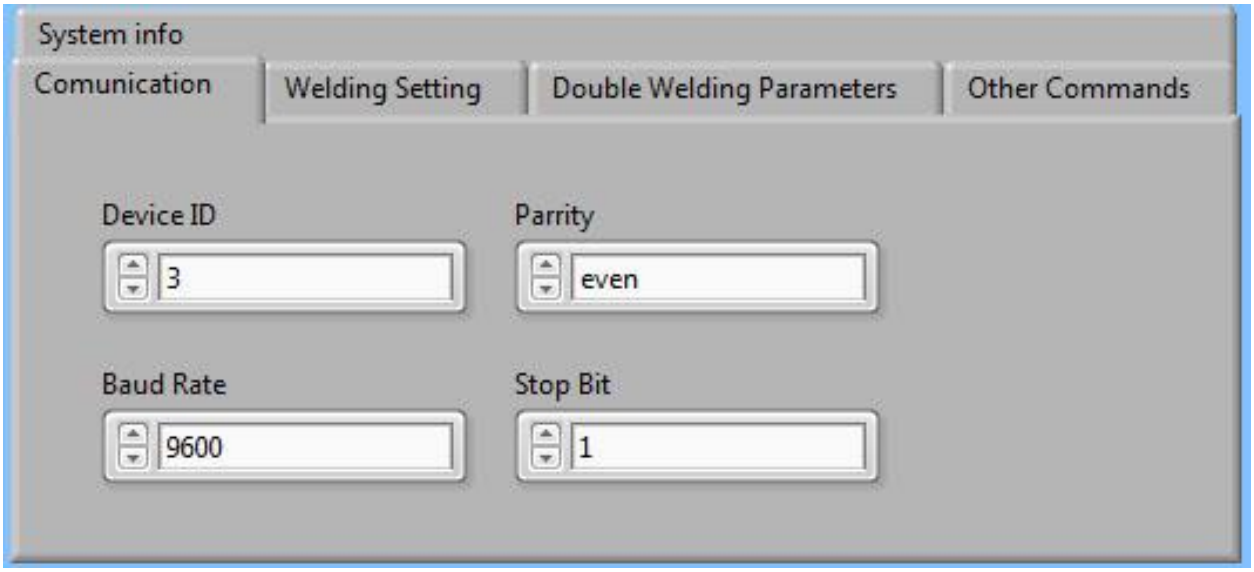
If you have pressed the "Read Serial Setting" button on the previous page, the above page will open. After opening this page, first select the port (if selected correctly, the port will be green) and then turn the device off and on. After reading these values, this page is closed and the main page is opened.

7.2 The main page of the program



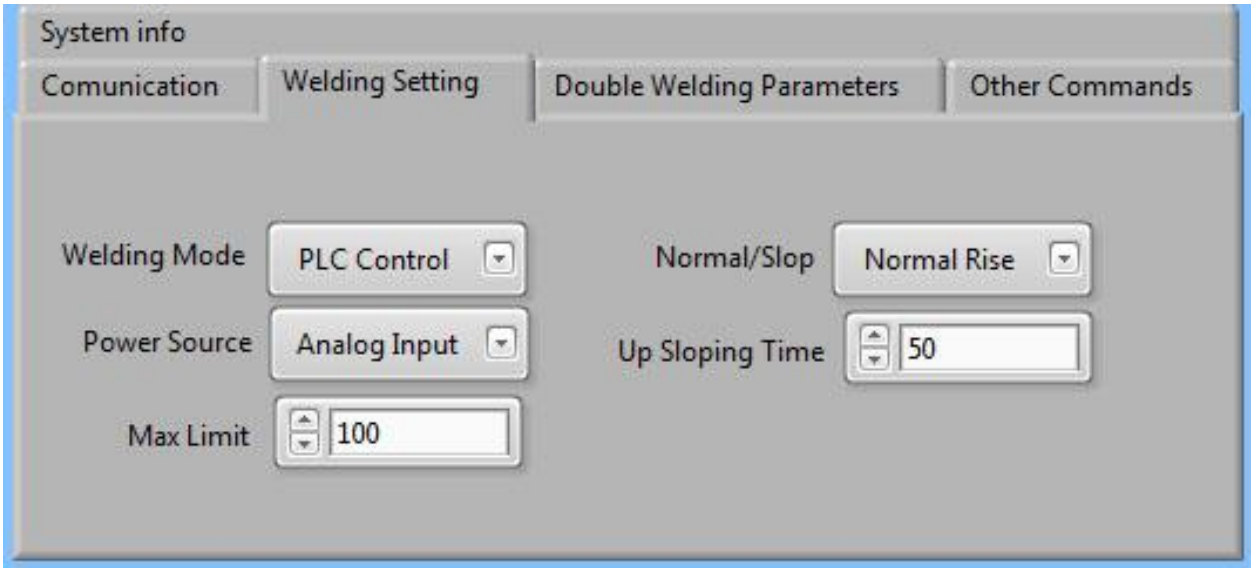
1. Use this button to close the program.
   - Save Setting button to save settings.
   - The Reset button is for restarting.
2. Displays the current output power percentage.
3. Displays the input analog value as a percentage.
4. These tools are used to set the values of serial power and constant power.
5. Various program tabs for settings

7.2.1 Setting related to RS 485 serial communication



*Please note that the transmitter needs to be reset once to apply changes to serial communication settings.

7.2.2 Welding settings



Welding Mode: The working mode of the module can be selected between PLC Control and Double Welding.

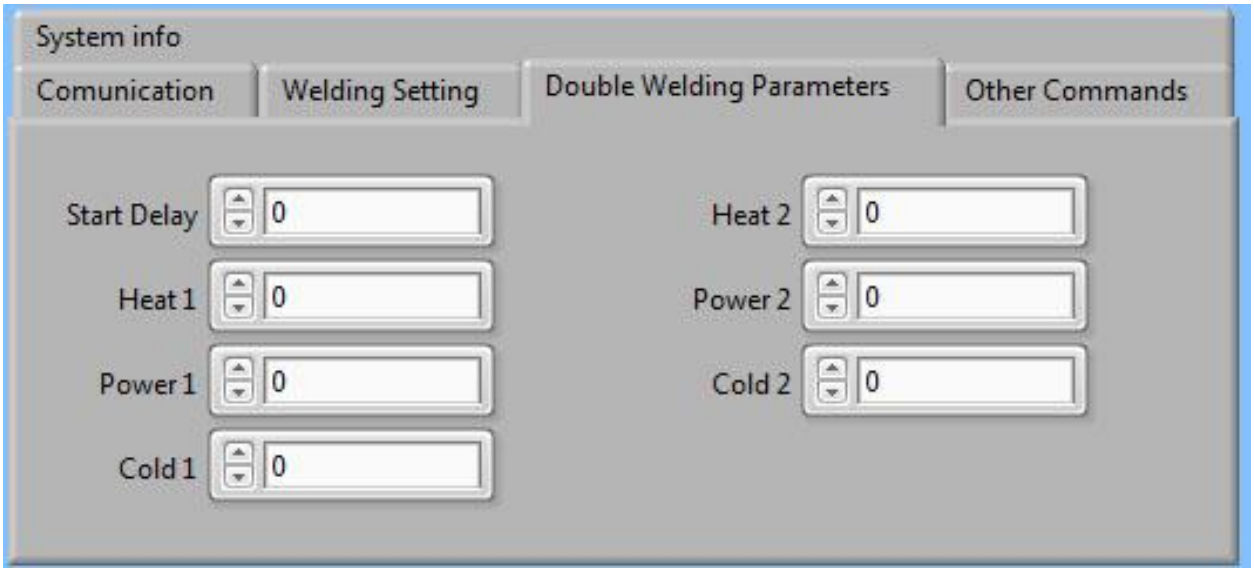
Power Source: In the PLC Control working mode, the output power setting source can be changed between analog input options, serial value, and fixed value.

Max Limit: In PLC Control working mode, the output power can be limited using this value.

Normal/Slop: How to increase the output power can be determined.

Up Slop Time: If the power increase is set as Slop, the slope of the power increase can be adjusted.

7.2.3 Settings related to double welding



These parameters are fully explained in "6.6 Double welding parameters".

Save Double Welding Setting button should be used to save these values.