PERFORMANCE
MADE
SMARTER

Configuration Manual
9203 / 4511
Modbus RTU configuration of
9203 Solenoid / alarm driver

TEMPERATURE | I.S. INTERFACES | COMMUNICATION INTERFACES | MULTIFUNCTIONAL | ISOLATION | DISPLAY

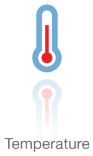
No. 9203MCM101-UK
For 4511 devices from ser. no. 141590001

PR electronics

6 Product Pillars
to meet your every need

Individually outstanding, unrivalled in combination

With our innovative, patented technologies, we make signal conditioning smarter and simpler. Our portfolio is composed of six product areas, where we offer a wide range of analog and digital devices covering over a thousand applications in industrial and factory automation. All our products comply with or surpass the highest industry standards, ensuring reliability in even the harshest of environments and have a 5-year warranty for greater peace of mind.



Temperature

Our range of temperature transmitters and sensors provides the highest level of signal integrity from the measurement point to your control system. You can convert industrial process temperature signals to analog, bus or digital communications using a highly reliable point-to-point solution with a fast response time, automatic self-calibration, sensor error detection, low drift, and top EMC performance in any environment.

I.S. Interface

We deliver the safest signals by validating our products against the toughest safety standards. Through our commitment to innovation, we have made pioneering achievements in developing I.S. interfaces with SIL 2 Full Assessment that are both efficient and cost-effective. Our comprehensive range of analog and digital intrinsically safe isolation barriers offers multifunctional inputs and outputs, making PR an easy-to-implement site standard. Our backplanes further simplify large installations and provide seamless integration to standard DCS systems.

Communication

We provide inexpensive, easy-to-use, future-ready communication interfaces that can access your PR installed base of products. All the interfaces are detachable, have a built-in display for readout of process values and diagnostics, and can be configured via push-buttons. Product specific functionality includes communication via Modbus and Bluetooth and remote access using our PR Process Supervisor (PPS) application, available for iOS and Android.

Multifunction

Our unique range of single devices covering multiple applications is easily deployable as your site standard. Having one variant that applies to a broad range of applications can reduce your installation time and training, and greatly simplify spare parts management at your facilities. Our devices are designed for long-term signal accuracy, low power consumption, immunity to electrical noise and simple programming.

Isolation

Our compact, fast, high-quality 6 mm isolators are based on microprocessor technology to provide exceptional performance and EMC-immunity for dedicated applications at a very low total cost of ownership. They can be stacked both vertically and horizontally with no air gap separation between units required.

Display

Our display range is characterized by its flexibility and stability. The devices meet nearly every demand for display readout of process signals, and have universal input and power supply capabilities. They provide a real-time measurement of your process value no matter the industry, and are engineered to provide a user-friendly and reliable relay of information, even in demanding environments.

Contents

Introduction

This configuration manual

contains the necessary information for configuring a PR 9203 device which is connected to a PR 4511 Modbus RTU enabler.

Modbus is a "master-slave" system,

where the "master" communicates with one or multiple "slaves".

The master typically is a PLC (Programmable Logic Controller), DCS (Distributed Control System), HMI (Human Machine Interface), RTU (Remote Terminal Unit) or PC.

The three most common Modbus versions used are: MODBUS ASCII, MODBUS RTU and MODBUS/TCP.

In Modbus RTU, data is coded in binary, and requires only one communication byte per data byte. This is ideal for use over multi-drop RS485 networks, at speeds up to 115,200 bps.
The most common speeds are 9,600 bps and 19,200 bps.

Modbus RTU is the most widely used industrial protocol and is supported by the 4511.

Modbus RTU

To communicate with a slave device, the master sends a message containing:

Device Address - Function Code - Data - Error Check

The Device Address is a number from 0 to 247.

Messages sent to address 0 (broadcast messages) will be accepted by all slaves, but numbers 1-247 are addresses of specific devices. With the exception of broadcast messages, a slave device always responds to a Modbus message so the master knows the message was received.

4511 Supported Modbus Function Codes

Command	Function code
Read Holding Registers	03
Read Input Registers	04
Write Single Register	06
Diagnostics	08
Write Multiple Registers	16

The Function Code defines the command that the slave device is to execute, such as read data, accept data, report status. Some function codes have sub-function codes.

The Data defines addresses in the device's memory map for read functions, contains data values to be written into the device's memory, or contains other information needed to carry out the function requested.

The Error Check is a 16-bit numeric value representing the Cyclic Redundancy Check (CRC).

Maximum number of registers which can be read or written at once

For a read command, the limit is 8 registers at a baud rate up to 38,400 bps,
16 registers @ 57,800 bps and 32 registers @ 115,200 bps.

For a write command, the limit is 123 registers at baud rates up to 115,200 bps.

4511 Modbus parameter settings

Automatic Baudrate Detection:	Can be configured YES or **NO**
Supported baudrates:	2400, 4800, 9600, **19.2k**, 38.4k, 57.6k, 115.2k bps
Parity Mode:	**Even**, Odd or None parity
Stop Bits:	**1** or 2 stop bits
Response delay:	0...1000 ms **(0 ms = default)**
Modbus slave addressing range:	1 - 247 **(247 = default address)**
Modbus Parameter Storage:	Saved in non-volatile memory in the 4511 device
(Factory Default Values are marked in **bold**)	

Modbus RTU segment line termination

A 120 Ohm resistor should be installed on both ends of a RS485 Modbus RTU segment loop to prevent signal echoes from corrupting data on the line.

9202 Configuration Parameter List

Category	Parameter Name	No.	Modbus Address	Register Size	Read/ Write	Type	Description	Values
GENERAL	DEVICE NUMBER	0	0	1	RO	UNSIGNED INTEGER	Defines the actual device number	9203 = 37379 (0x9203)
GENERAL	DEVICE VERSION	1	1	1	RO	UNSIGNED INTEGER	Product version	0
GENERAL	PASSWORD	3	3	1	R/W	UNSIGNED INTEGER	Password for entering configuration menu	Range: 0...9999
GENERAL	PASSWORD TRY	4	4	1	R/W	UNSIGNED INTEGER	Password attempted for entering configuration menu	Range: 0...9999
DISPLAY	DISPLAY CONTRAST	8	8	1	R/W	UNSIGNED INTEGER	Contrast in the LCD display	Range: 0...9
DISPLAY	DISPLAY BACKLIGHT	9	9	1	R/W	UNSIGNED INTEGER	Backlight intensity in LCD	Range: 0...9
DISPLAY	LINE FUNCTION	10	10	1	R/W	INTEGER	Information shown in input line of display in monitor mode (normal mode).	LOAD = 0 TAG = 1 D.OUT = 2 ALTERNATING = 3
GENERAL	ENABLE PASSWORD	11	11	1	R/W	INTEGER	Password protect entry to configuration menu	NO = 0 YES = 1
GENERAL	HELP TEXT LANGUAGE	12	12	1	R/W	INTEGER	Language for the help texts shown on display.	UK = 0 DK = 1 DE = 2 FR = 3 SE = 4 IT = 5 ES = 6
GENERAL	SIL ENABLE *1)	13	13	1	RO	INTEGER	Read SIL mode.	NO = 0 YES = 1
GENERAL	DEVICE TYPE	14	17	1	RO	INTEGER	Defines the actual device type together with the device no. e.g. 9203B1A = 0x0B1A	B1A = 2842 (0x0B1A) B1B = 2843 (0x0B1B) B2A = 2858 (0x0B2A
INPUT	CHANNEL 1 FUNCTION	15	18	1	R/W	UNSIGNED INTEGER	Select function type for channel 1.	INVERT = 0 DIRECT = 1
DISPLAY	CHANNEL 1 TAG TEXT	16	20	3	R/W	ASCII CHAR	Tag of the device channel 1 (5 characters).	Range: ASCII values from 32 to 90 (' ' to 'Z')
INPUT	CHANNEL 2 FUNCTION	17	23	1	R/W	UNSIGNED INTEGER	Select function type for channel 2.	INVERT = 0 DIRECT = 1
DISPLAY	CHANNEL 2 TAG TEXT	18	25	3	R/W	ASCII CHAR	Tag of the device channel 2 (5 characters).	Range: ASCII values from 32 to 90 (' ' to 'Z')
GENERAL	CHECKSUM	100	100	1	RO	UNSIGNED INTEGER	CRC16 checksum of the configuration	Range 0...65536
GENERAL	Configuration counter	101	101	1	RO	UNSIGNED INTEGER	This counter will count the number of times the configuration has been changed. The counter is reset on power-up	Range 0...65536

*1) If SIL mode is set by an authorized SIL user (SIL ENABLE = YES), **all** parameters become READ ONLY

9203 Process Parameter List

Parameter Name	No.	Register Address	Register Size	Read/ Write	Type	Description	Values
CONFIGU-RATION STATUS	1000	1000	2	RO	INTEGER	Shows the device configuration according to the SIL setting	**"FAIL"** No valid configuration has been received. **"OPEN"** Actual configuration is NOT locked (non-SIL). **"LOCK"** Actual configuration is locked (SIL). **"INIT"** Initial status after a powerup/reset until a configuration has been received.
ERROR STATUS	1001	1002	1	RO	INTEGER	Status of common errors for the device.	CRC ERROR: bit 0 = 1 CALIBRATION ERROR: bit 1 = 1 CONFIGURATION ERROR: bit 2 = 1 READ ERROR: bit 3 = 1 WRITE ERROR: bit 4 = 1 SUPPLY ERROR: bit 5 = 1 CPU ERROR: bit 6 = 1 FLASH/RAM/CRC ERROR: bit 7 = 1
MEASURE STATUS	1002	1003	1	RO	UNSIGNED INTEGER	Shows the device measurement status.	CH1 ENERGIZED: bit 0 = 1 CH1 BREAK DETECT: bit 1 = 1 CH1 SHORT DETECT: bit 2 = 1 CH1 CONFIG DIRECT READBACK: bit 3 = 1 CH2 ENERGIZED: bit 4 = 1 CH2 BREAK DETECT: bit 5 = 1 CH2 SHORT DETECT: bit 6 = 1 CH2 CONFIG DIRECT READBACK: bit 7 = 1
CHANNEL 1 CURRENT	1003	1004	1	RO	UNSIGNED INTEGER	Shows the measurement of channel 1 in mA.	Range: 0...255
CHANNEL 1 STATUS	1004	1005	1	RO	UNSIGNED INTEGER	Shows the status ofchannel 1.	FREQ. ABOVE 1Hz: bit 0 = 1 FREQ. ABOVE 5Hz: bit 1 = 1
CHANNEL 2 CURRENT	1005	1006	1	RO	UNSIGNED INTEGER	Shows the measurement of channel 2 in mA.	Range: 0...255
CHANNEL 2 STATUS	1006	1007	1	RO	UNSIGNED INTEGER	Shows the status of channel 2.	FREQ. ABOVE 1Hz: bit 0 = 1 FREQ. ABOVE 5Hz: bit 1 = 1
MEASURE CONTROL	1007	1008	1	R/W	UNSIGNED INTEGER	Enables simulation of Error and Rail signals. Actual setting of the signals is controlled by OUTPUT STATE	RESERVED Must be set to 0 bit 0 RESERVED Must be set to 0 bit 1 Error out simulation, set by OUTPUT STATE bit 2 = 1 Rail signal simulation, set by OUTPUT STATE bit 3 = 1 RESERVED Must be set to 0 bit 4...7
OUTPUT STATE	1008	1009	1	R/W	UNSIGNED INTEGER	Shows status of Used to set value of the simulated process.	RESERVED Must be set to 0 bit 0...3 Error out simulation value (1=OFF, 2=ON) bit 4 Rail Signal simulation value (1=OFF, 2=ON) bit 5 RESERVED Must be set to 0 bit 6...7
TIMEOUT COUNTER	1009	1010	1	R/W	UNSIGNED INTEGER	Time-out counter which resets various bits in MEASURE CONTROL upon overflow and is automatically set to 133. Decrements once every 0.075 s.	Range: 0...255

4511 Modbus Configuration Parameter List

Parameter Name	No.	Register Address	Register Size	Read/ Write	Type	Description	Values
ENABLE MODBUS	1	3000	1	R/W	INTEGER	Enable Modbus communication. If disabled, 4511 ignores all frames sent from the Modbus master and the only way to re-enable Modbus communication is by using the 4511 menu.	NO = 0 YES = 1
BAUDRATE	2	3001	1	R/W	INTEGER	The baud value used for Modbus communication	2400 BAUD = 0 4800 BAUD = 1 9600 BAUD = 2 19200 BAUD = 3 38400 BAUD = 4 57600 BAUD = 5 115200 BAUD = 6
ENABLE AUTOBAUD	3	3002	1	R/W	INTEGER	Enable automatic baudrate detection. If enabled, 4511 determines the baudrate automatically by listening to frames sent on the Modbus line.	NO = 0 YES = 1
PARITY	4	3003	1	R/W	INTEGER	Configures parity check on Modbus frames	NONE = 0 EVEN PARITY = 1 ODD PARITY = 2
STOP BITS	5	3004	1	R/W	INTEGER	Configures the number of stop bits in Modbus frames	ONE STOP BIT = 1 TWO STOP BITS = 2
ADDRESS	6	3005	1	R/W	INTEGER	Configures the Modbus address of the 4511 (Address 0 is broadcast address)	Range: 1...247
RESPONSE DELAY	7	3006	1	R/W	INTEGER	Configures minimum delay for Modbus response in ms	Range: 0...1000

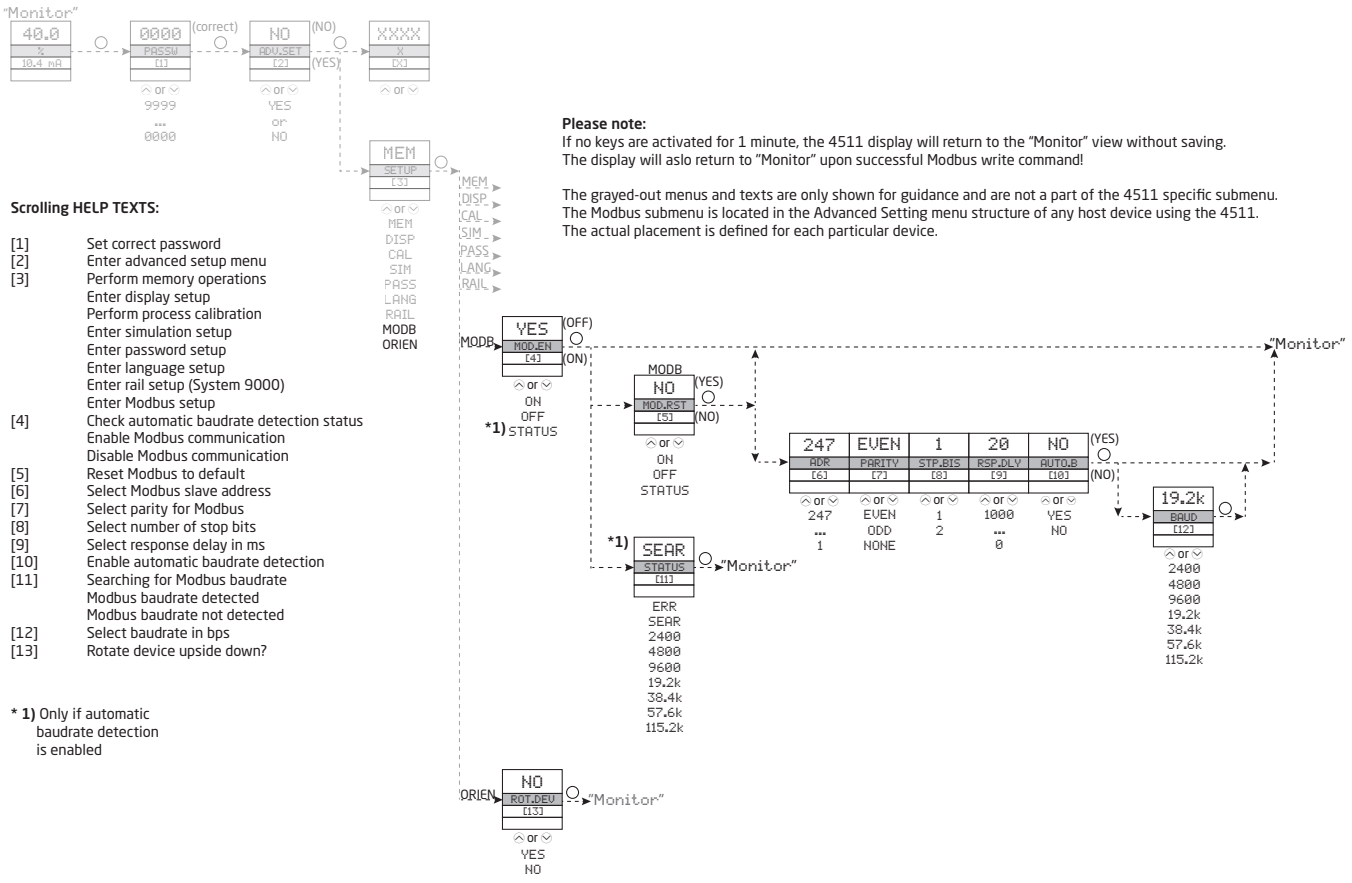
4511 Additional Parameter List

Parameter Name	No.	Register Address	Register Size	Read/ Write	Type	Description	Values
ROTATE DEVICE	1	3100	1	R/W	INTEGER	Enables the display and key buttons to be used normally when the host device is mounted upside down	NO = 0 YES = 1

4511 Modbus Status Parameter List

Parameter Name	No.	Register Address	Register Size	Read/ Write	Type	Description	Values
AUTOBAUD STATUS	1	4000	1	RO	INTEGER	Actual state of automatic baudrate detection	2400 BAUD = 0 4800 BAUD = 1 9600 BAUD = 2 19200 BAUD = 3 38400 BAUD = 4 57600 BAUD = 5 115200 BAUD = 6 SEARCHING = 7 ERROR = 8
IDENTIFY DEVICE	2	4001	1	R/W	INTEGER	Enables the device to flash the LCD background with approx. 4 Hz. **Value will automatically return to NO if not written within 10 seconds!**	NO = 0 YES = 1
MAXIMUM READ REGISTERS	3	4002	1	RO	INTEGER	Maximum allowed number of registers that can be read in one command, with the given/detected baudrate	Range: 8...32

4511 Modbus Front Programming Parameter Menu



Please note:
If no keys are activated for 1 minute, the 4511 display will return to the "Monitor" view without saving.
The display will aslo return to "Monitor" upon successful Modbus write command!

The grayed-out menus and texts are only shown for guidance and are not a part of the 4511 specific submenu.
The Modbus submenu is located in the Advanced Setting menu structure of any host device using the 4511.
The actual placement is defined for each particular device.

Scrolling HELP TEXTS:

[1]	Set correct password
[2]	Enter advanced setup menu
[3]	Perform memory operations
	Enter display setup
	Perform process calibration
	Enter simulation setup
	Enter password setup
	Enter language setup
	Enter rail setup (System 9000)
	Enter Modbus setup
[4]	Check automatic baudrate detection status
	Enable Modbus communication
	Disable Modbus communication
[5]	Reset Modbus to default
[6]	Select Modbus slave address
[7]	Select parity for Modbus
[8]	Select number of stop bits
[9]	Select response delay in ms
[10]	Enable automatic baudrate detection
[11]	Searching for Modbus baudrate
	Modbus baudrate detected
	Modbus baudrate not detected
[12]	Select baudrate in bps
[13]	Rotate device upside down?

*** 1)** Only if automatic baudrate detection is enabled

We are near you, *all over the world*

Our trusted red boxes are supported wherever you are

All our devices are backed by expert service and a 5-year warranty. With each product you purchase, you receive personal technical support and guidance, day-to-day delivery, repair without charge within the warranty period and easily accessible documentation.

We are headquartered in Denmark, and have offices and authorized partners the world over. We are a local business with a global reach. This means that we are always nearby and know your local markets well.
We are committed to your satisfaction and provide PERFORMANCE MADE SMARTER all around the world.

For more information on our warranty program, or to meet with a sales representative in your region, visit prelectronics.com.

Benefit today from
PERFORMANCE MADE SMARTER

PR electronics is the leading technology company specialized in making industrial process control safer, more reliable and more efficient. Since 1974, we have been dedicated to perfecting our core competence of innovating high precision technology with low power consumption. This dedication continues to set new standards for products communicating, monitoring and connecting our customers' process measurement points to their process control systems.

Our innovative, patented technologies are derived from our extensive R&D facilities and from having a great understanding of our customers' needs and processes. We are guided by principles of simplicity, focus, courage and excellence, enabling some of the world's greatest companies to achieve PERFORMANCE MADE SMARTER.