

GB6000 Series Modbus communication protocol

Description of the information that a host can exchange with the Gas Blender GB6000 using the Modbus RTU protocol.

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1 GB6000 INFORMATION

The Gas Blender GB6000 series structure consists of different **Sensor Module Channels** (from 2 to 6) to control flow rate and a **Main Board** to manage all the instrument parameters.

Here there is a list of the informations managed from the Gas Blender that are accessible with the Modbus RTU protocol.

1.1 MAIN BOARD DICTIONARY

This is the list of the information provided from the main board:

1. Serial Number (Ex. "GB1A08120027")
2. FW Version (Ex. "GB1_1.06_A 03/11/10")
3. FW date (Ex. 23.5)
4. Device model
5. Purchase date
6. Warranty time
7. Number of channels
8. Device status
9. Device alarm
10. Temperature

1.2 SENSOR DICTIONARY

Here is the list of the information provided from each channel:

1. KP (pid parameter)
2. KI (pid parameter)
3. KD (pid parameter)
4. FF
5. Max sum error
6. Serial Number
7. FW version
8. Table Identifier
9. Calibration points number
10. Calibration Gas identifier
11. Calibration full scale
12. Calibration lab identifier
13. Calibration Operator Identifier
14. Calibration serial number 1
15. Calibration serial number 2
16. Calibration temperature
17. Calibration pressure
18. Calibration accuracy identifier
19. Calibration K factor
20. Calibration reference
21. Gas identifier
22. Channel enabled

- 23. Channel balance
- 24. Target SCCM
- 25. Target percent
- 26. Target raw
- 27. FW date
- 28. Status
- 29. Alarm
- 30. Sensor status
- 31. Sensor information
- 32. Sensor raw
- 33. Sensor counter
- 34. Sensor value av
- 35. Sensor raw av
- 36. PID kp
- 37. PID KI
- 38. PID KD
- 39. PID max err
- 40. Sensor min value
- 41. Sensor max value

1.3 COMMANDS TO CONTROL FLOW

The Gas Blender Device uses a proprietary protocol with 2 different type of commands:

- Main-Board commands
(The main board is the main control in the gas blender; these commands haven't an address because they are managed only by the main board)
- Modules commands
(The module is the board to manage the channel gas; there are up to 6 modules in the gas blender so the commands require the address of module: 1/2/3/4/5/6).

2 MODBUS RTU

Modbus RTU protocol is an easy way to command the mass flow; this protocol exchanges information with the main board to change the total flow, to change the percent value of every channel and to start the control. All the commands are managed by the main board and there aren't direct commands to the modules.

Communication information: Modbus RTU : 115200,N,8,1

The Modbus data type supported are:

- Holding register (read command 0x03 /write command 0x10): word 16 bit

The main board address is 1.

2.1 LIST OF THE EXPORTED INFORMATION

2.1.1 READ: Holding registers (03H)

2.1.1.1 Main Board

Add.	Words	Description	Format	Unit
0	1	FW Version	Int16	Number hex 0xHHLL
1	1	HW Version	Int16	Number hex 0xHHLL
2	1	Status	Int16	BitField (*)
3	1	Alert	Int16	BitField (**)
4	1	Temperature	Int16	C°/100
5	1	Number of channels	Int16	Number
6	1	Idx channel balance	Int16	Number (0..nCh-1)
7	2	Total flow	Int16	SCCM
9	1	Working status	Int16	0/1

(*) Status

Bitfield value, when the bits are ON they have the following meaning:

Bit	Hex Value	meaning
BIT0	0x01	System ready
BIT1	0x02	System connected with PC
BIT2	0x04	Control ON – gas flowing
BIT3	0x08	At least a gas channel present

For example reading 0x09 means the system is ready and at least a channel module has been detected.

(**) Alert

Bitfield value, the with the following meaning:

Bit	Hex Value	meaning
BIT0	0x01	Generic Error
	0x02	
	0x04	
	0x08	
BIT4	0x10	Wrong Parameter
BIT5	0x20	Serial Number error
	0x40	
BIT6	0x80	Warranty error

For example reading 0xA0 means the system in error for serial number and warranty information.

2.1.1.2 Modules

For every channel, the addresses are an offset from the channel base address;

Channel	Base address
1	10
2	25
3	40
4	55
5	70
6	85

offset	Words	Description	Format	Unit
0	1	FW Version	Int16	Number hex 0xHHLL
1	1	HW Version	Int16	Number hex 0xHHLL
2	1	Alert	Int16	BitField (**)
3	1	Id gas - calibration	Int16	Number (0..11)
4	1	K factor - calibration	Int16	Number/10000
5	1	Channel Enabled	Int16	0/1
6	1	Percent value	Int16	%/100
7	1	Id gas	Int16	Number (0..11)
8	1	K factor gas	Int16	Number/10000
9	2	SCCM	Int16	SCCM
11	2	Target SCCM	Int16	SCCM

(**) Alert

Bitfield value, the with the following meaning:

Bit	Hex Value	meaning
BIT0	0x01	Generic Error
BIT1	0x02	Calibration Error
BIT2	0x04	Wrong address
BIT3	0x08	Sensor Error
..		
BIT15	0x08000	Link error with this module

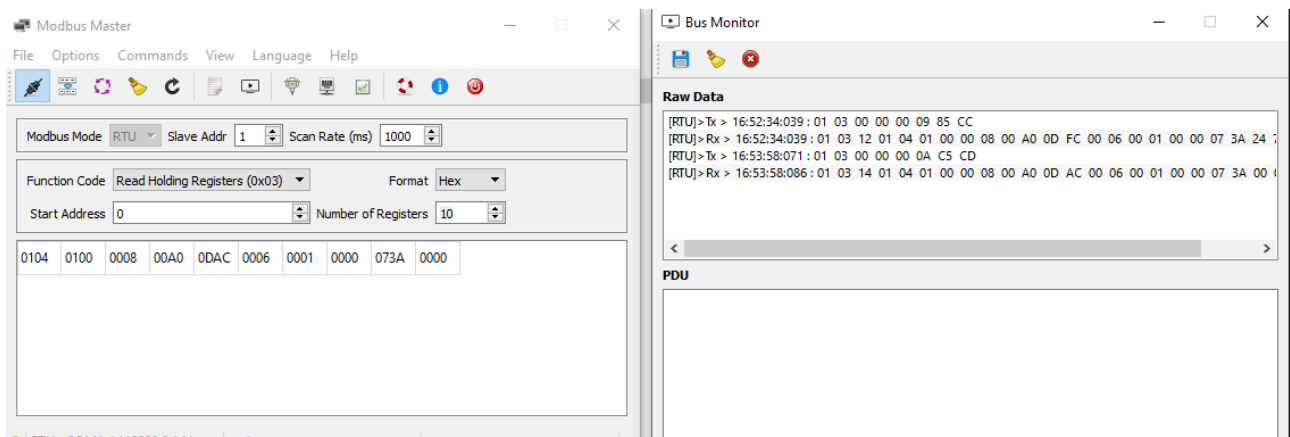
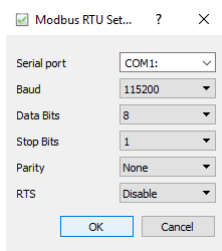
2.1.2 WRITE: Holding registers (10H)

Add.	Words	Description	Format	Unit
6	1	Idx channel balance	Int16	Number (0..nCh-1)
7	2	Total flow	Int16	SCCM
9	1	Working status	Int16	0/1

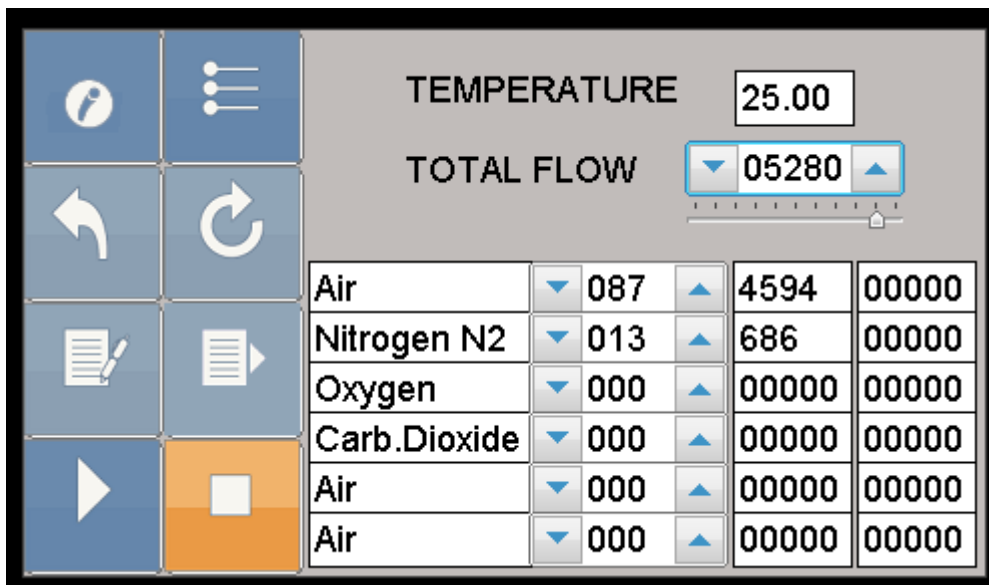
For every module:

offset	Words	Description	Format	Unit
5	1	Channel Enabled	Int16	0/1
6	1	Percent value	Int16	%/100
7	1	Id gas	Int16	Number (0..11)
8	1	K factor gas	Int16	Number/10000

3 EXAMPLE USING QMODMASTER



4 HMI : SCREEN SHOT

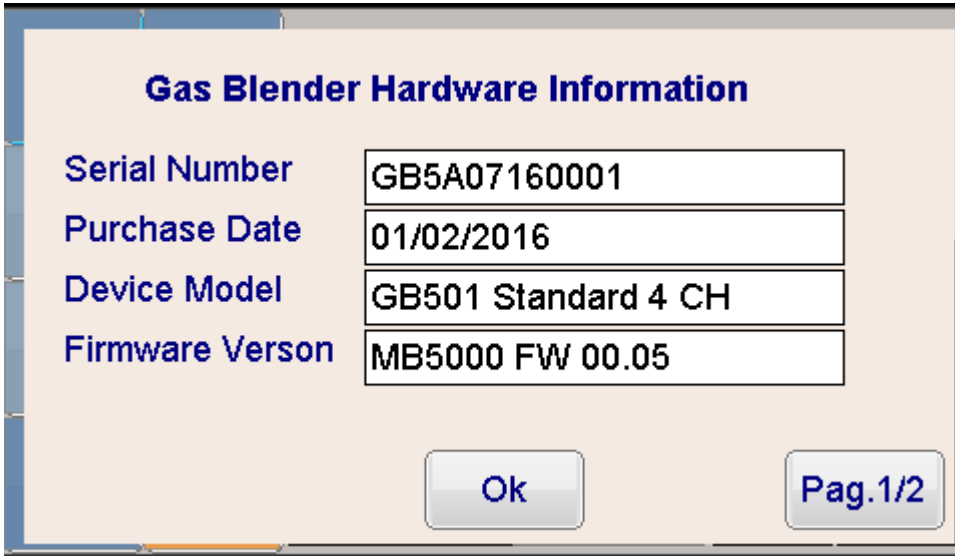


Main page

From this page the user can modify the total flow, the gas percentage and can command the start/stop of the flow. He can do it tapping the glass or with command in modbus:

1. Command 7 (2 words) for the total flow
2. Commands 16,31,46,61,76,91 for the gasses percentage

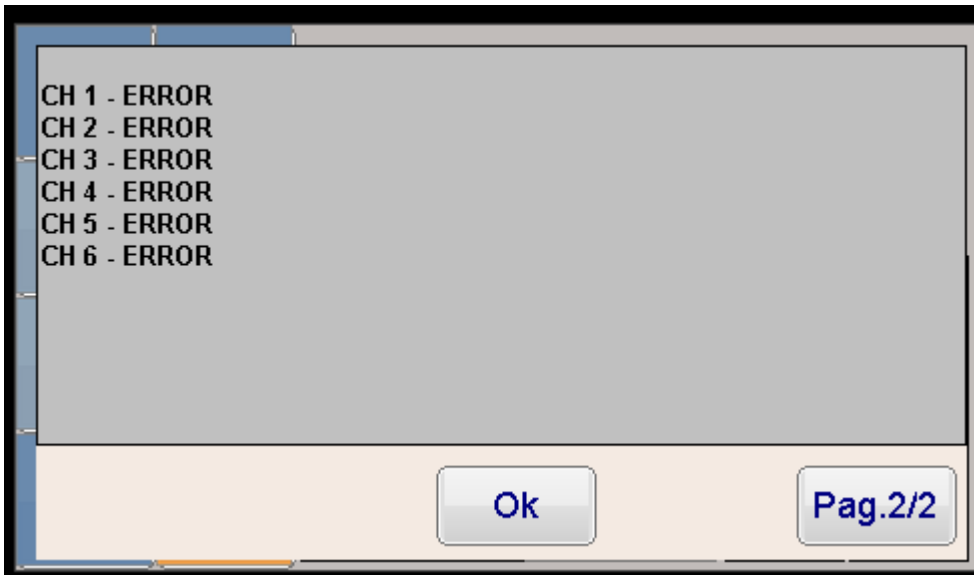
3. Command 9 to start / stop the flow



Gas Blender Hardware Information	
Serial Number	GB5A07160001
Purchase Date	01/02/2016
Device Model	GB501 Standard 4 CH
Firmware Version	MB5000 FW 00.05

Ok Pag.1/2

Information pag1 – to get information of the gas blender configuration



CH 1 - ERROR
CH 2 - ERROR
CH 3 - ERROR
CH 4 - ERROR
CH 5 - ERROR
CH 6 - ERROR

Ok Pag.2/2

And the page 2 to get information of the modules. Usually there is information about the firmware version of the module and the calibration gas type, but in the example there is a communication error. This means the modules are not working.

!! Working with non native calibration gas may introduce inaccuracy !!

GAS TYPE	Balance	Enable	Native
Air	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Nitrogen N2	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Oxygen	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Carb.Dioxide	<input type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>

Default Gas

Ok Cancel

The gas configuration page to select the gas type, to define the balance channel and to enable the gas channel; the modbus commands are:

- Commands 17,32,47,62,77,92 for the gasses type; values supported are:
 - 1 = Air
 - 2 = Nitrogen N2
 - 3 = Oxygen O2
 - 4 = Carbon Dioxide CO2
 - 5 = Carbon Monoxide CO
 - 6 = Nitric Oxide NO
 - 7 = Hydrogen H2
 - 8 = Helium He
 - 9 = Argon Ar
 - 10 = Methane CH4
 - 11 = Ethylene C2H4
 - 12 = Ethane C2H6
- Command 6 to select the balance channel (valid values are 1..6)
- Commands 15,30,45,60,75,90 to enable the gasses (write 0 to disable and 1 to enable)

Writing in modbus while this page is open will not update the values on the screen; it's better to stay in the main page, change the values with modbus and at the end tap the touch screen to enter this page and see the effect of the modbus commands.