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ModBus Programming Procedure for GSL-IT-DA

SUPPLEMENT TO USER MANUAL

INTRODUCTION

By means of this procedure described it's possible to program the ModBus protocol in the GSL-IT-DA solarimeter, with an easy way to program and enable, step by step, the RS-485 port for data communication concerning Irradiation and Temperature, including activation and configuration for digital outputs.

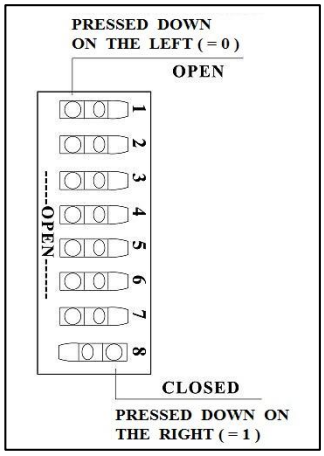
NOTE:
These instructions must be used in conjunction with GSL-IT-DA User Manual (Ref. 030_ma)

By programming the instrument it's possible to select different output modes, such as: Pulse digital output, Serial ModBus RTU. Current (4 ÷ 20 mA) output is always available.

NOTE:
One mode excludes the other: when the solarimeter is configured in ModBus communication mode, pulse digital output aren't longer updated, but the instrument can be probed through RS-485 serial port.

DIGITAL OUTPUTS

1 – Verify that all 8 dip-switch are in **OPEN** position, then supply the solarimeter.
2 – Move the dip-switch 8 to **CLOSED**: The "IRRADIATION" LED lights on steadily, the configuring phase has begun and the solarimeter doesn't acquire any more neither Irradiation nor Temperature.
3 – Let the dip-switch 7 in **OPEN** position to select the digital outputs.
4 – Move the dip-switch 6 to **CLOSED** to read Irradiation and internal Temperature in the solarimeter. Instead, leave it on **OPEN** to read Irradiation and external Temperature with PT100 connected.
5 – Move the dip-switch 8 to **OPEN** to save the setting. " IRRADIATION" LED lights OFF, while "TEMPERATURE" LED lights ON.
6 – Press **RESET** to resume normal operation, with the new setting.



RS-485 MODBUS

This solarimeter supports ModBus-RTU-Slave protocol through RS-485 (8-X-1 protocol, where X is the parity). To ensure a correct working it's necessary to close both the extremities of the RS-485 line by inserting the Jumper J1 on the devices at the extremities of the line (see the picture on the enclosed document, Ref. 030_ma).

1 – Verify that all 8 dip-switch are in **OPEN (= 0)** position, then supply the solarimeter.
2 – Move the dip-switch 8 to **CLOSED (= 1)**: "IRRADIATION" LED lights steadily, the configuring phase has begun and the solarimeter doesn't acquire any more neither Irradiation nor Temperature.
3 – Move the dip-switch 7 to **CLOSED (= 1)** to enter ModBus setting mode.
4 – Move the dip-switches from 1 to 3 according to the combinations shown on the left table below to select the communication speed (Baud Rate).

Dip Switch			Baud Rate
1	2	3	bit/s
0	0	0	2400
1	0	0	4800
0	1	0	9600
1	1	0	19200
0	0	1	38400
1	0	1	57600
0	1	1	115200

Dip Switch		Parity
4	5	
0	0	None
1	0	Even
0	1	Odd
1	1	None + 2 stop bits

5 – Move the dip-switches from 4 to 5 according to the combinations shown on the right table above to select the Parity.

6 – Move to **OPEN (= 0)** the dip-switch 8 to save the setting. " IRRADIATION" LED lights OFF, while "TEMPERATURE" LED lights ON.
7 – Press **RESET** to resume normal operation, with the new ModBus setting.
8 – Move the dip-switches from 1 to 7 according to the combinations shown on the table below to select the solarimeter's address, from 1 to 128, according to the logic shown:

	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
5 6 7 8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5 6 7 8	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 6 7 8	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
5 6 7 8	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
5 6 7 8	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
5 6 7 8	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
5 6 7 8	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
5 6 7 8	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128

Example:  = 59 = OPEN (status 0) = CLOSED (status 1)

WORKING IN MODBUS MODALITY

The command **" Read Holding Register "** (0x03) is identified; it makes possible the specification of a begin-reading address from 0000 to 0009, with the number of data to be read (16 bits per data) from 1 to 10. The solarimeter will answer with the requested data, in accordance with the following table:

Address	Content	Data	Data type	Measure units
0000	Status	0 = Calibration error **(*)** 1 = Calibration OK	Unsigned int	---
0001	Irradiation	0 ÷ 1200	signed int	W/m^2
0002	PT100 External Temperature	-40,0 ÷ +180,0	signed int	°C x 10
0003	Internal Temperature	-40,0 ÷ +180,0	signed int	°C x 10
0004	Average value of Irradiance	0 ÷ 1200	Unsigned int	W/m^2
0005	Average value of External Temperature	-40,0 ÷ +180,0	signed int	°C x 10
0006	Average value of Internal Temperature	-40,0 ÷ +180,0	signed int	°C x 10
0007	N° average values of Irradiance	1 ÷ 7200	Unsigned int	---
0008	N° average values of External Temperature	1 ÷ 7200	Unsigned int	---
0009	N° average values of Internal Temperature	1 ÷ 7200	Unsigned int	---

(*) NOTE: An eventual 0 value on the "Status" data (calibration error) signals a wrong operating condition: contact Energy Team assistance.

COMMUNICATION CHARACTERISTICS

- The values of temperature are transmitted as tenths of degree/Celsius with sign: for example, if 0x00FD hexadecimal value is received (corresponding to 253 in decimal), the effective temperature measured is 253/10 = 25,3 °C.

- The average values of the sizes acquired are set to zero when the corresponding register is read every time. In the absence of reading-cycle the average value is stored for a maximum time of 2 hours, after that it's automatically set to zero.

- The sizes concerning Irradiation and Temperature are acquired every second; however, it's possible to probe the solarimeter several times per second, obtaining in response the last acquired value.

- If, for any reason, a data is out of the valid measuring range (for example: if the external probe isn't connected), the 0xAA00 hexadecimal value (22016 decimal) is transmitted, corresponding to a reading too low, or 0XAAFF (21761 decimal), corresponding to a reading too high.

- If a command different than 0x03 or an impossible combination of addresses and data are sent to Solarimeter's ModBus address, will return a message showing an operative error respectively of **Illegal Function** or **Illegal Address.** Instead, if other types of error will be recognized, the master request will be ignored.

NOTE:
Avoid to program the configuration parameters when a ModBus communication has already started. In the possibility of insert the solarimeter into a ModBus network already existing, disconnect the corresponding clamp during the programming steps.