Multi I/O

- User's manual -

Thank you for choosing a product from our *Multi I/O* range.

The accessorys described in this manual are high quality products that have been carefully designed and manufactured to ensure the highest performance.

This manual provided detailed instructions on how to use and install the accessory.

Please <u>READ THE MANUAL CAREFULLY BEFORE YOU USE THE MULTI I/O</u> and keep it handy near the device for consultation on how to take full advantage of the features of your new purchase.

SAFETY

This part of the manual contains SAFETY instructions that should be followed scrupulously.

Ø˙ The equipment must not be used without a ground connection if it is powered at high voltage.

Ø˙ Ensure that the connectors subjected to high voltages are correctly isolated.

Ø˙ All the models in this range have been built for professional purposes and are therefore not suitable for use in a domestic environment.

Ø˙ The equipment has been designed for use in closed environments. It should not be installed near inflammable liquids, gas or any other toxic substances.

Ø˙ Ensure that water or any other liquid and/or objects do not fall into the equipment.

Ø˙ Do not attempt to repair any failures and/or abnormal operation, but contact the nearest technical support centre.

Ø˙ The equipment must be used only for the purpose for which it was designed. Any other use is considered improper and therefore dangerous. The manufacturer is not liable for any damage caused by improper, incorrect or unreasonable usage of the equipment.

PRESENTATION

Multi I/O has been designed to integrate the UPS monitoring with configurable input and output management. The accessory, which must be connected to the UPS through a serial interface, manages 8 inputs (configurable as digit input, analog input or temperature sensor) and 8 clean contact relay outputs (configurable in accordance with the inputs and the UPS operating mode). The UPS status and that of the device can be monitored from the three separate serial lines (SERIAL 1, SERIAL 2 and SERIAL 3). The accessory is compatible with all UPS models that use GPSER and SENTR communication protocols (PRTK: GPSER1…, SENTR1...).
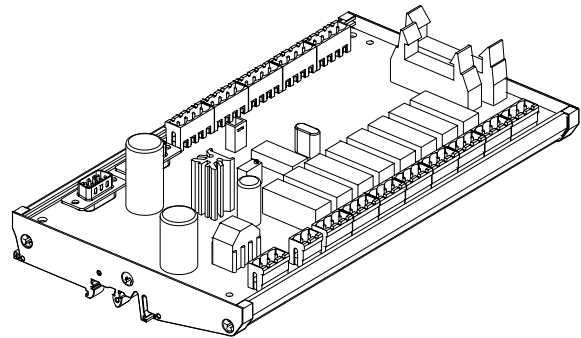
The device can be powered either at 230 V_{AC} or 9 V_{DC}.

There are two versions of *Multi I/O* available - a "BOX" version and the "O.F." (Open Frame) version. Both versions have the same features and the contents of this manual apply to both products (unless otherwise specified).
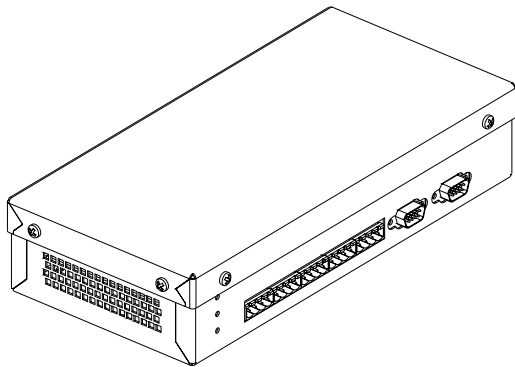
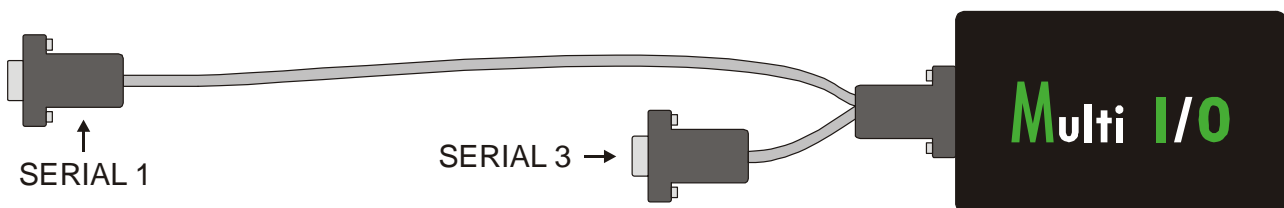**"BOX" version**   **"O.F." version**

SERIAL 1 / SERIAL 3 COMMUNICATION PORT

The SERIAL 1 / SERIAL 3 communication port offers two RS-232 serial lines that can be used to monitor the UPS with the following protocol:

Protocol	Baud Rate [bps]	Parity	Stop bit
GPSER	1200	None	1

To use the SERIAL 1 and SERIAL 3 lines, connect the supplied serial cable as indicated in the figure below.

SERIAL 2 COMMUNICATION PORT

The SERIAL 2 port has one Half-Duplex RS-485 serial line or an RS-232 serial line that can be used to monitor the UPS with the following protocols:

Protocol	Baud Rate [bps]	Parity	Stop bit
GPSER	1200	**None**	**1**
	2400		
	4800	Equal	
MODBUS / JBUS RTU	**9600**		2
	19200	Odd	

N.B. The values shown in bold are the default configuration values.

When the GPSER protocol is used on the SERIAL 2 port:

Ø˙ with RS-232 line, the device address **must** be set to zero

Ø˙ with RS-485 line, the device address **must not** be set to zero

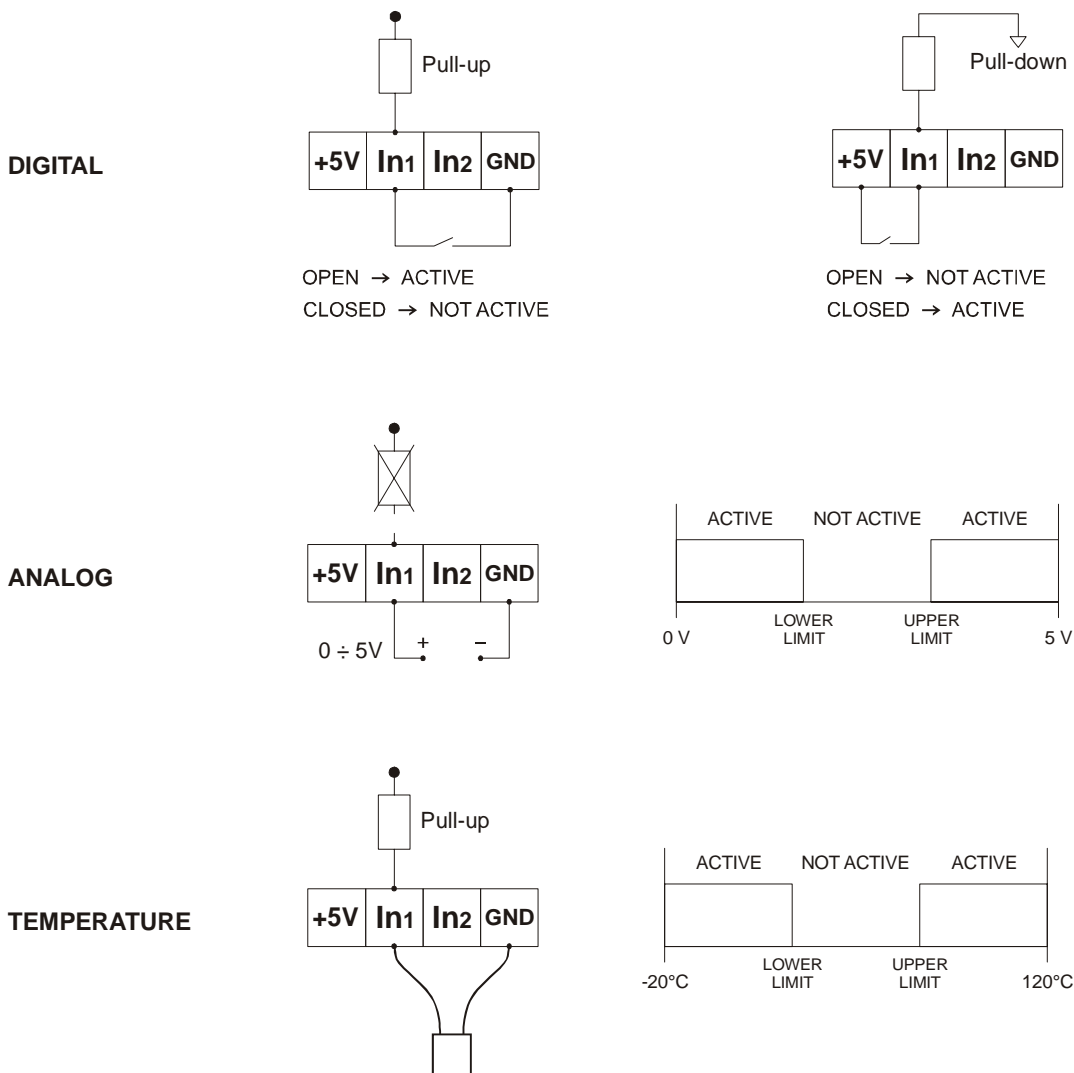N.B. see the paragraph on "Address configuration".

INPUTS

The eight inputs can be configured separately one from the other as:

∉# Digital input
∉# Analog input with 0V - 5V range
∉# Temperature sensor with –20°C - 120°C range (supplied with the accessory).

A pull-up or pull-down resistance can be selected for each input. If an input is configured as an analog input or as a temperature sensor, a greater and/or lower threshold value can be associated with it.
It is also possible to define the delay between one signal detected on the input and the next. The delay value must be in the range 10 – 2,500 ms. If the input is configured as an analog input or temperature sensor, the predetermined delay coincides with the time interval during which n signal samples are recorded with a sampling frequency of 10 ms (n = delay[ms] / 10). An average is then taken on the n samples. If the input is configured as a digital, it is still sampled every 10 ms. If the sampled value is greater than 2.5V, a counter is incremented, or if the value is lower than 2.5V, a counter is decremented. When the counter reaches value n = delay[ms] / 10, the input signal is considered high, instead when the counter falls below zero, the input signal is considered low.
In the default configuration, all the inputs are configured as digital inputs with a pull-down resistance.
Some examples of the possible configuration (Digital, analog and temperature) are shown below:

DIGITAL

Pull-up

| +5V | In1 | In2 | GND |

OPEN → ACTIVE
CLOSED → NOT ACTIVE

Pull-down

| +5V | In1 | In2 | GND |

OPEN → NOT ACTIVE
CLOSED → ACTIVE

ANALOG

| +5V | In1 | In2 | GND |

0 ÷ 5V   +   −

ACTIVE   NOT ACTIVE   ACTIVE

0 V   LOWER LIMIT   UPPER LIMIT   5 V

TEMPERATURE

Pull-up

| +5V | In1 | In2 | GND |

ACTIVE   NOT ACTIVE   ACTIVE

-20°C   LOWER LIMIT   UPPER LIMIT   120°C

OUTPUTS

One or more UPS events (active status) and/or one or more inputs can be associated with the eight outputs. These UPS events are described in the table below:

| EVENT	ACTIVE STATUS	NON ACTIVE STATUS	DEFAULT
Output powered	Output voltage present	Output voltage not present	OUTPUT 4
UPS locked	Inverter blocked for failure/fault	Normal inverter operation	-
Battery working	UPS in battery mode	UPS powered by mains	OUTPUT 1
Battery low	Batteries low warning	Batteries not discharged	OUTPUT 2
UPS on bypass	Load powered by bypass line	Load powered by inverter (if the UPS is on)	OUTPUT 3
UPS failure	Anomaly detected	No anomalies	OUTPUT 7
Overload alarm	Output overload	Normal output load	OUTPUT 5
Overtemperature alarm	Internal overtemperature	Normal internal temperature	OUTPUT 6
Bypass line not good	Bypass line outside tolerance values	Normal bypass line	-
Bypass command active	Bypass command present	No bypass command present	-
Batteries charged	Batteries fully charged	Batteries not charged	OUTPUT 8
Replace batteries	Batteries need replacing	Batteries still efficient	-
Shutdown active	Scheduled shutdown active	Scheduled shutdown not active	-
Shutdown imminent	Shutdown warning active	Shutdown warning not active	-
Test in progress	UPS test in progress	No test in progress	-
Communication lost	Communication with UPS is lost	Communication with UPS is normal	-

DESCRIPTION

If an output is associated with one of the events listed in the table above, the relays for that output will be closed when an active state occurs. If an output is associated with one of the inputs that is configured as a digital input, the relay of the output in question will be closed when the input goes high. If an output is associated with one of the inputs that has been configured as an analog input or temperature sensor, the relay of the output in question will be closed when the signal on the input falls outside the predetermined values.

Several UPS events and/or inputs can be associated with a single output. In this case, the relay of the output will close when at least one of the associated events occurs.

EXAMPLE:
OUTPUT 1 in the default configuration
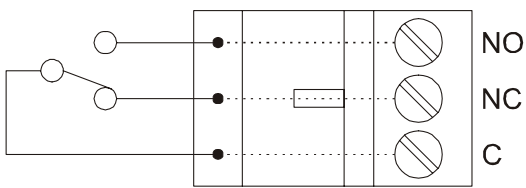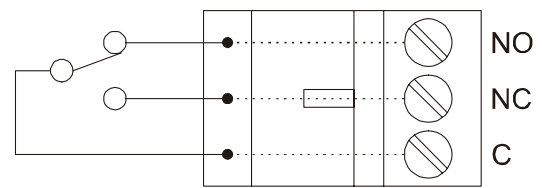
UPS powered by mains   UPS powered by batteries

FIRMWARE UPGRADE

The user can reprogram the accessory in order to upgrade the firmware. The upgrade files and relevant instructions can be found on the manufacturer's web site.

OPENING THE PACKAGING AND CHECKING ITS CONTENTS

On opening the packaging, first of all check the contents.
The packaging should contain:
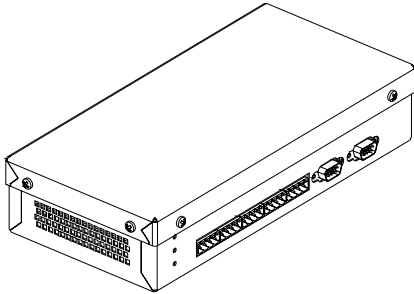
£ · ***Multi I/O*** "BOX" version   £ · ***Multi I/O*** "O.F." version

OR

£ · Temperature sensor   £ · Serial cable

£ · Three-pole connector cover and cable tie (only   £ · Installation manual and CD-Rom
for the "BOX" version)

INSTALLATION
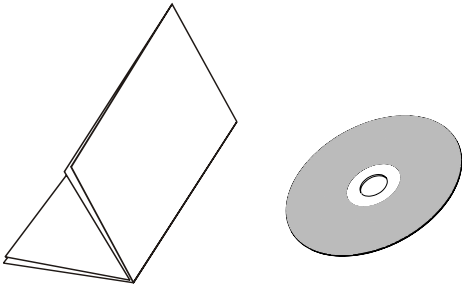
SOFTWARE CONFIGURATIONS

The MultiSetup.exe program supplied on the CD-Rom can be used to:

⍚ Select the protocol used by theUPS
⍚ Configure the communication parameters of the three serial ports
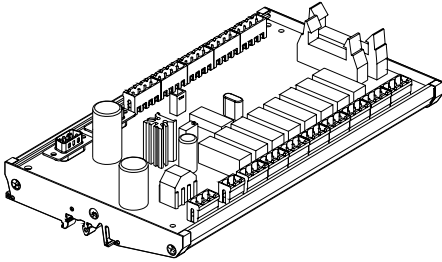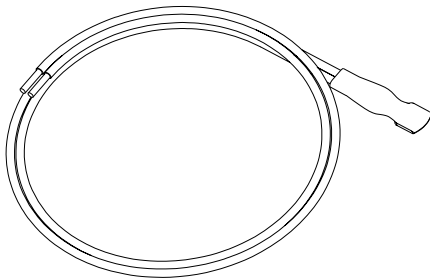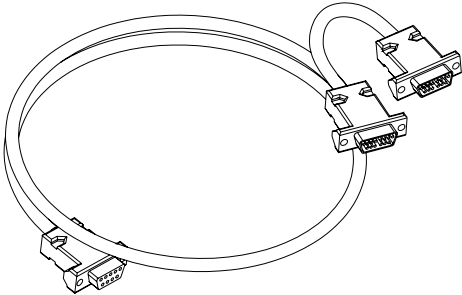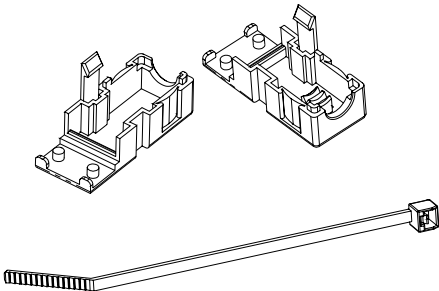⍚ Select the type of input, set the minimum and maximum threshold values and the delay
⍚ Associate the UPS events and/or inputs with the outputs.

To be able to use the program, the SERIAL 1 or SERIAL 3 port must be connected to a serial port on the PC using the supplied serial cable (see the paragraph entitled "SERIAL 1 / SERIAL 3 Communication Port"). To confirm the chosen configuration, the accessory must be switched off and then on again or reset by pressing the Reset button.

JUMPER CONFIGURATION

<table>
<tr><td>⚠</td><td><u>RISK OF ELECTRIC SHOCK.</u>
MAKE SURE THAT THE DEVICE IS SWITCHED OFF BEFORE
TOUCHING THE JUMPERS.</td><td>⚠</td></tr>
</table>

<table>
<tr><td>⚠</td><td>FOR THE <i>MULTI I/O</i> BOX VERSION:
⍚ Remove the cover, by unscrewing the screws that hold it in place, to access the jumpers.
⍚ Do not switch on the device without the cover, as some parts of the circuit remain powered with high voltage
⍚ For safety, the cover must screwed back in place using the screws and washers provided.</td><td>⚠</td></tr>
</table>
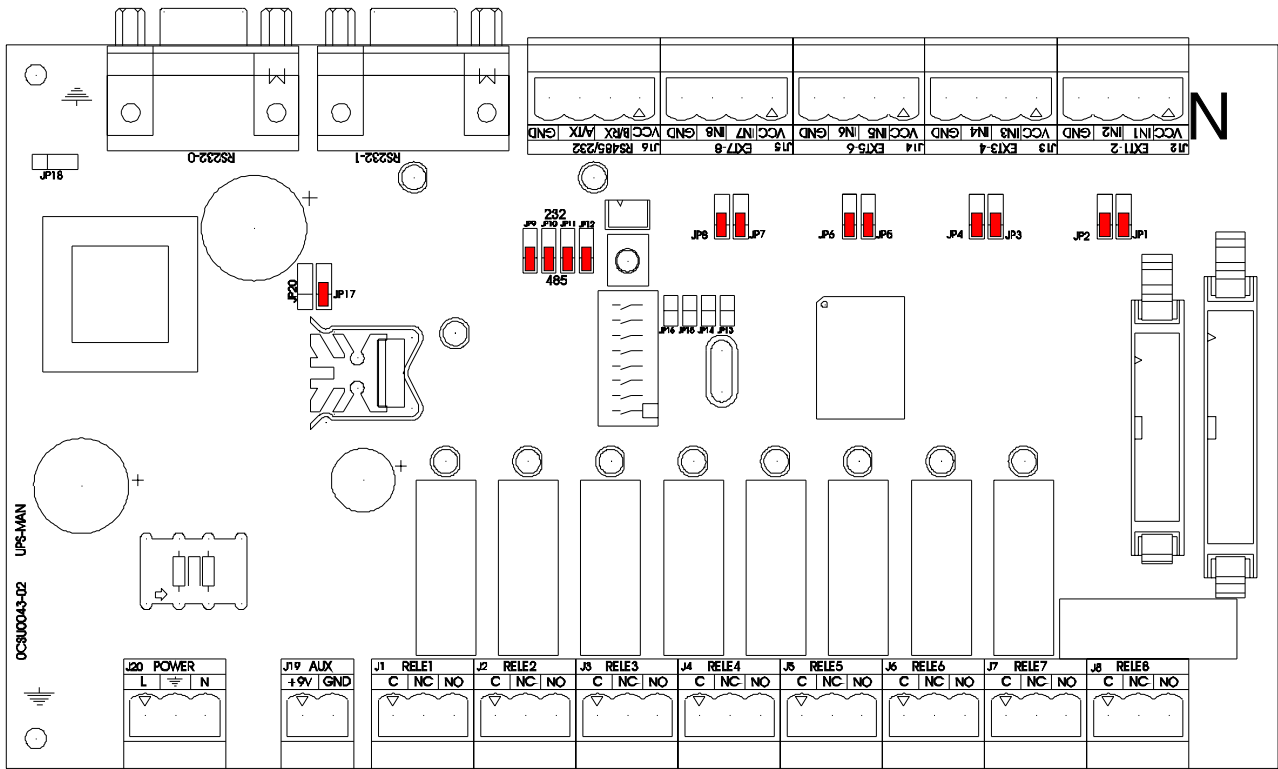
Jumper default settings

A pull-up or pull-down resistance can be selected for each input by positioning the jumpers JP1, JP2, JP3, JP4, JP5, JP6, JP7 and JP8 as indicated in the table below. The pull-up or pull-down resistance must be selected in accordance with the type of input (see the paragraph entitled "Inputs"):

⍯ Digital: select as pull-up, pull-down or open input
⍯ Analog: leave the jumper open
⍯ Temperature sensor: select a pull-up resistance for the input and connect the sensor between the input and GROUND.

The SERIAL 2 port can be set as an RS-232 port or Half Duplex RS-485 port, by setting the jumpers JP9, JP10, JP11, JP12 as shown in the table below.

JUMPER: Possible configurations		
JP1	INPUT 1	
JP2	INPUT 2	
JP3	INPUT 3	**PULL DOWN**: 2 low pins closed [DEFAULT]
JP4	INPUT 4	**PULL UP**: 2 high pins closed
JP5	INPUT 5	**NO RESISTANCE**: Open
JP6	INPUT 6	
JP7	INPUT 7	
JP8	INPUT 8	
JP9		
JP10	**RS-485**: 2 low pins closed (on 485 engraved side) [DEFAULT]	
JP11	**RS-232**: 2 high pins closed (on 232 engraved side)	
JP12		
JP13		
JP14	OPEN	
JP15		
JP16		
JP17	2 low pins closed	
JP18	NOT MOUNTED	
JP20	OPEN	

CLOSED **OPEN** **NOT MOUNTED**
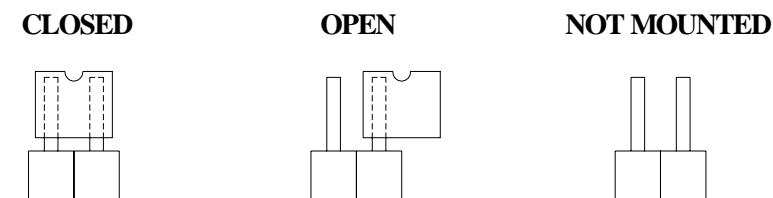
2 pin jumper **:** illustration of the possible settings

INSTALLATION

ADDRESS CONFIGURATION

Position the DIP-switches as shown in the table below to modify the address of the device:

SLAVE ADDRESS	DIP 1	DIP 2	DIP 3	DIP 4	DIP 5
0	0	0	0	0	0
1 (DEFAULT value)	1	0	0	0	0
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1
17	1	0	0	0	1
18	0	1	0	0	1
19	1	1	0	0	1
20	0	0	1	0	1
21	1	0	1	0	1
22	0	1	1	0	1
23	1	1	1	0	1
24	0	0	0	1	1
25	1	0	0	1	1
26	0	1	0	1	1
27	1	1	0	1	1
28	0	0	1	1	1
29	1	0	1	1	1
30	0	1	1	1	1
31	1	1	1	1	1

To set a value greater than 31, select a base address (0 = default, 32, 64, 96, 128, 160, 192, 224) using the MultiSetup.exe program.
Slave Address = Base Address + [DIP-switch configuration].

TERMINATION RESISTANCE OF THE RS-485 BUS

The device is supplied with the termination resistance already mounted inside (Rt=120). Change the position of DIP-switch 6 to insert this resistance:

⊄# DIP-switch n° 6 ON   Rt inserted

⊄# DIP-switch n° 6 OFF   Rt not inserted [DEFAULT value]

CONNECTORS

"BOX" VERSION (front and rear views):

POWER SUPPLY 230Vac — POWER SUPPLY 9Vdc — OUTPUT 1 ÷ 8

INPUT 1 ÷ 8 — SERIAL COMMUNICATION PORTS

"O.F." VERSION:

UPS SERIAL — SERIAL 1 SERIAL 3 — SERIAL 2 — INPUT 1 ÷ 8

POWER SUPPLY 230Vac — POWER SUPPLY 9Vdc — OUTPUT 1 ÷ 8
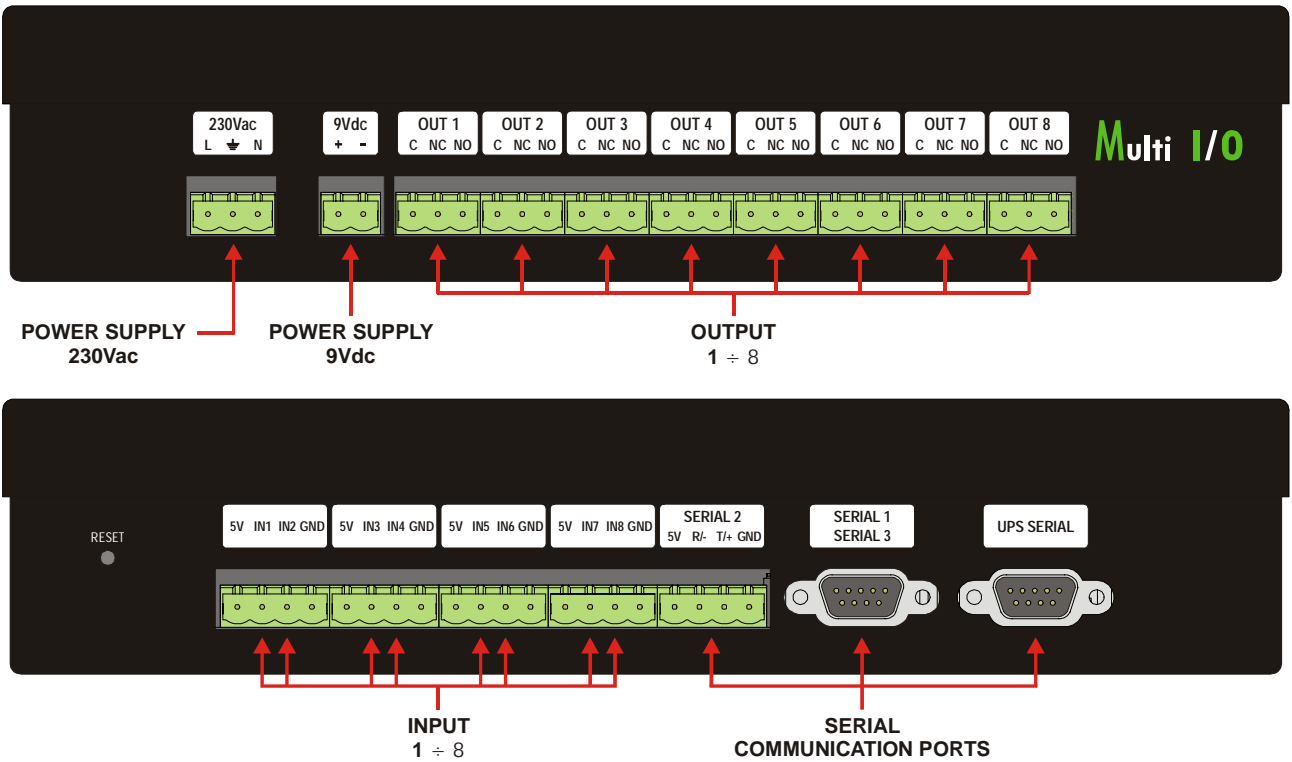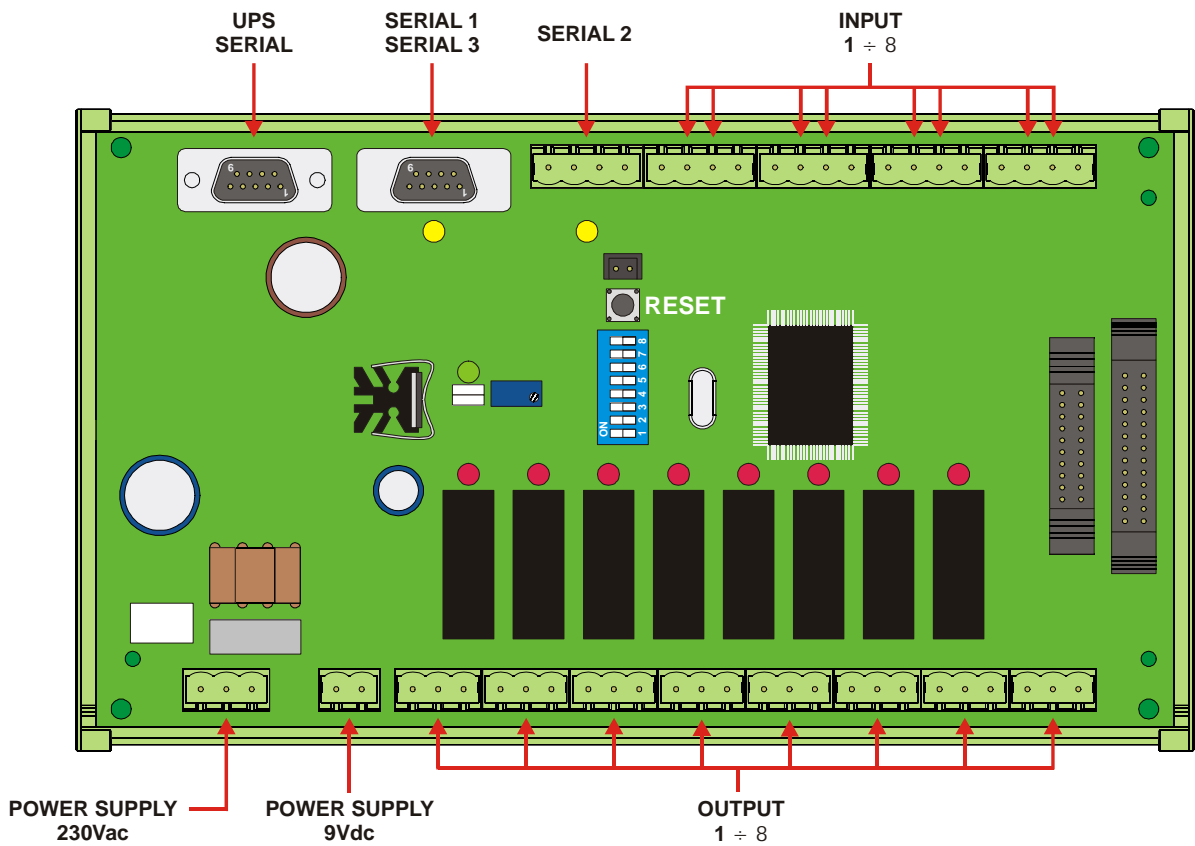
⚠ **ALL CONNECTIONS SUBJECTED TO VOLTAGE OF MORE THAN 50V MUST COMPLY WITH SAFETY REGULATIONS** ⚠
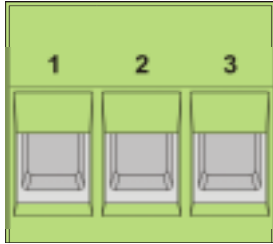
230 Vac Power supply		
PIN #	SYMBOL	DESCRIPTION
1	L	PHASE
2	⏚	GROUND
3	N	NEUTRAL
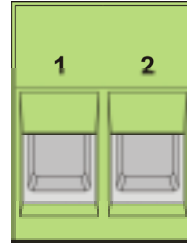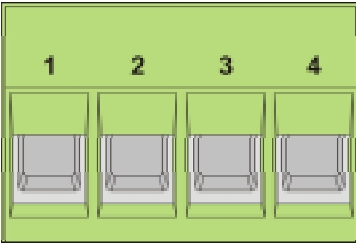
9 Vdc Power supply		
PIN #	SYMBOL	DESCRIPTION
1	+	+ 9 Vdc
2	-	GROUND

OUTPUT 1 - OUTPUT 8 Terminal board		
PIN #	SYMBOL	DESCRIPTION
1	C	COMMON
2	NC	NORMALLY CLOSED
3	NO	NORMALLY OPEN
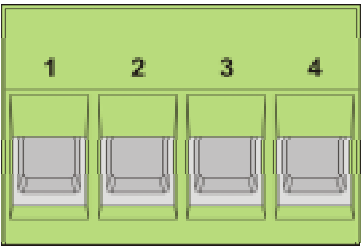
NOTE: The "COMMON" contacts of the eight relays are all separate.
All the output contacts are at zero potential.

INPUT 1 - INPUT 8 Terminal board		
PIN #	SYMBOL	DESCRIPTION
1	**5V**	POWER SUPPLY [1]
2	**IN1** [2]	INPUT 1
3	**IN2** [3]	INPUT 2
4	**GND**	GROUND

[1] See the "TECHNICAL SPECIFICATIONS" for the maximum loads supported.
[2] Depending on the terminal board IN1 (INPUT 1) becomes IN3 (INPUT 3), IN5 (INPUT 5), IN7 (INPUT 7)
[3] Depending on the terminal board IN2 (INPUT 2) becomes IN4 (INPUT 4), IN6 (INPUT 6), IN8 (INPUT 8)

SERIAL 2 Terminal board			
PIN #	SYMBOL	SIGNAL	
		RS485	RS232
1	**5V**	POWER SUPPLY	
2	**R/-**	RXTX-	RXD
3	**T/+**	RXTX+	TXD
4	**GND**	GROUND	

SERIAL 1 – SERIAL 3 Connector	
PIN #	SIGNAL
1	n.c.
2	SERIAL 1 RXD
3	SERIAL 1TXD
4	SERIAL 3 TXD
5	GROUND
6	SERIAL 3 RXD
7	RTS
8	n.c.
9	n.c.

n.c. ⇓ not connected

TECHNICAL SPECIFICATIONS

MULTI I/O	
Input voltage	170 - 260 Vac (50 - 60 Hz) **OR** 9 ± 0.5 Vdc (max. current 600 mA)

Operating temperature	$0 - 40$ °C
Storage temperature	$-5 - 50$ °C
Relative operating humidity	max.80%
Relative storage humidity	max. 90%

Dimensions	265 x 128 x 57 mm ("BOX" version)
	217 x 128 x 55 mm ("O.F." version)
Weight	1.4 Kg ("BOX" version)
	0.3 Kg ("O.F." version)

Maximum load on each output (OUTPUT 1 - 8)	4A @ 250Vac
	4A @ 30Vdc

Maximum load per power supply Vdc = 5V	100 mA	Vdc = 4.9V @ 20mA
		Vdc = 4.5V @ 100mA

SERIAL CABLE SPECIFICATIONS

SERIAL1

SERIAL3

- ENGLISH -
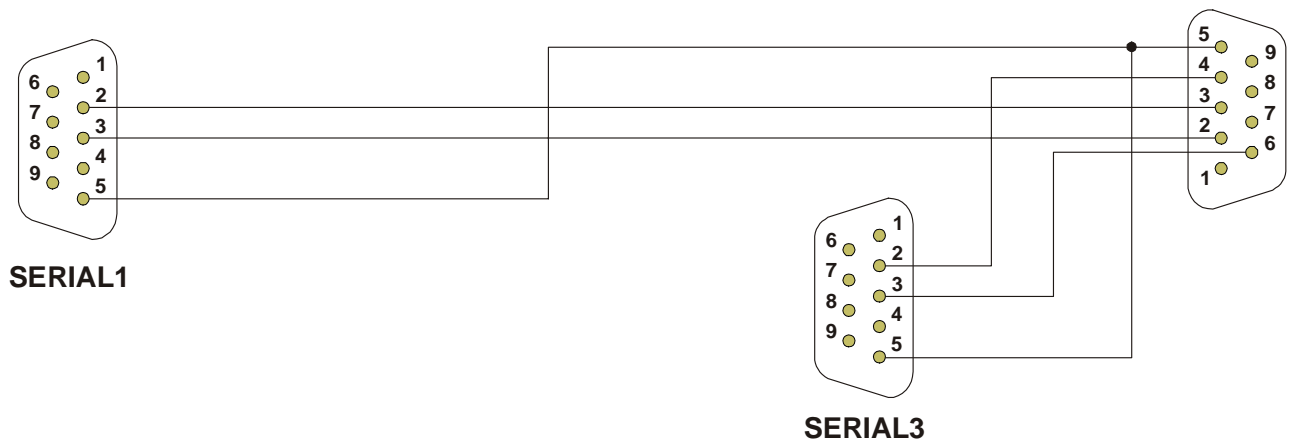
SUPPORTED FUNCTION

SUPPORTED FUNCTION	FUNCTION DESCRIPTION	ACCESSIBLE DATA AREA
1 (0x01)	BIT READING	STATES
2 (0x02)		STATES
3 (0x03)	REGISTERS READING	ALL
4 (0x04)		ALL
6 (0x06)	SINGLE REGISTER WRITING	COMMANDS
16 (0x10)	MULTIPLE REGISTER WRITING	COMMANDS

TABLES OF STATES, MEASUREMENTS, NOMINAL DATA AND COMMANDS

REGISTER[1]		STATES	BIT[2]	
NUMBER	ADDRESS		NUMBER	ADDRESS
1	0		1	0
		Test in progress	2	1
			3	2
		Shutdown active	4	3
			5	4
		Battery charged	6	5
		Battery charging	7	6
		Bypass bad	8	7
			9 ∋ 11	8 ∋ 10
		On bypass	12	11
		Battery low	13	12
		Battery working	14	13
		UPS locked	15	14
		Output powered	16	15
2	1		17 ∋ 28	16 ∋ 27
		Input Mains present	29	28
		Alarm temperature	30	29
		Alarm overload	31	30
		UPS failure	32	31
3	2		33 ∋ 48	32 ∋ 47
4	3		49 ∋ 63	48 ∋ 62
		Communication lost with UPS	64	63
5 ∋ 8	4 ∋ 7		65 ∋ 128	64 ∋ 127

[1] *The register number **n** must be addressed **n-1** in the data packet.*
[2] *The bit number **n** must be addressed **n-1** in the data packet.*

REGISTER[1]		MEASUREMENTS	UNIT
NUMBER	ADDRESS		
9 э 11	8 э 10		
12	11	**Input** mains star voltage V1	V
13	12	Input mains star voltage V2	V
14	13	Input mains star voltage V3	V
15	14	Input current phase L1	0.1*A
16	15	Input current phase L2	0.1*A
17	16	Input current phase L3	0.1*A
18	17	Input frequency	0.1*Hz
19 э 21	18 э 20		
22	21	**Bypass** mains star voltage V1	V
23	22	Bypass mains star voltage V2	V
24	23	Bypass mains star voltage V3	V
25	24	Bypass frequency	0.1*Hz
26	25	**Output** star voltage V1	V
27	26	Output star voltage V2	V
28	27	Output star voltage V3	V
29 э 31	28 э 30		
32	31	Output current phase L1	0.1*A
33	32	Output current phase L2	0.1*A
34	33	Output current phase L3	0.1*A
35	34	Output peak current phase L1	0.1*A
36	35	Output peak current phase L2	0.1*A
37	36	Output peak current phase L3	0.1*A
38	37	Load phase L1	%
39	38	Load phase L2	%
40	39	Load phase L3	%
41 э 43	40 э 42		
44	43	Output frequency	0.1*Hz
45 э 47	44 э 46		
48	47	**Battery** voltage	0.1*V
49 э 50	48 э 49		
51	50	Battery current	0.1*A
52	51	Remaining Battery Capacity	%
53	52		
54	53	Remaining back-up time	Minutes
55 э 61	54 э 60		
62	61	Internal UPS **temperature**	°C
63	62	Sensor 1 temperature	°C
64	63	Sensor 2 temperature	°C
65 э 72	64 э 71		

[1] *The register number **n** must be addressed **n-1** in the data packet.*

REGISTER[1]		NOMINAL DATA	UNIT
NUMBER	ADDRESS		
73э77	72э76		
78	77	**Output** nominal voltage (star)	V
79	78	Output nominal frequency	0.1*Hz
80	79	Output nominal power	100*VA
81э83	80э82		
84	83	**Battery** nominal capacity (battery expansion included)	Ah
85	84	Battery benches	(1 or 2)
86	85	Battery type	Integer
87э112	86э111		

REGISTER[1]		COMMANDS	UNIT
NUMBER	ADDRESS		
113	112	Command code [2]	Integer
114	113	Shutdown delay time	Seconds
115	114	Restore delay time	Minutes
116	115		
117	116	Command result [3]	Integer
118	117		

REGISTER[1]		DIAGNOSTIC	UNIT
NUMBER	ADDRESS		
119	118	Counter of processed correct messages	Integer
120	119	Counter of processed NOT correct messages	Integer

[1] *The register number **n** must be addressed **n-1** in the data packet*

[2] *Refer to "Command codes" paragraph*

[3] *Command result = Command code if command is handled from the UPS*
Command result = Command code + 100 if command is NOT handled from the UPS
Command result = 0 if Command code is wrong

MODBUS/JBUS PROTOCOL

REGISTER[1]		SPECIAL FLAGS (SENTR UPS)[2]	UNIT
NUMBER	ADDRESS		
121	120	Byte 1 of "s = xx.." code / Byte 2 of "s = ..xx" code	Flags
122	121	Byte 1 of "c = xx.." code / Byte 2 of "c = ..xx" code	Flags
123	122	Byte 1 of "b = xx.." code / Byte 2 of "b = ..xx" code	Flags
124	123	Byte 1 of "r = xx..-.." code / Byte 2 of "r = ..xx-.." code	Flags
125	124	Byte 3 of "r = ...-xx" code / Byte 1 of "i = xx..-.." code	Flags
126	125	Byte 2 of "i = ..xx-.." code / Byte 3 of "i = ...-xx" code	Flags
127	126	Byte 1 of "a = xx..-...." code / Byte 2 of "a = ..xx-...." code	Flags
128	127	Byte 3 of "a = ...-xx.." code / Byte 4 of "a = ...-..xx" code	Flags

REGISTER[1]		MultiCOM DATA	UNIT
NUMBER	ADDRESS		
129	128	Firmware version	Integer*100
130	129	Sensor 1 temperature [3]	°C
131	130	Sensor 1 humidity [3]	%

[1] *The register number **n** must be addressed **n-1** in the data packet*

[2] *In order to decode these registers, please refer to the UPS manual*

[3] *Only for models with environmental control sensors*

COMMANDS CODES

CODE	COMMAND
1 (0x0001)	Command Shutdown
2 (0x0002)	Command Shutdown and Restore
3 (0x0003)	Delete Command (code 1, 2, 12)
12 (0x000C)	UPS on Bypass
20 (0x0014)	Test Battery
22 (0x0016)	Test Panel

0MNUMIONPA