



MicroDowell SpA / via dei Boschi, 2 – 33040 Pradamano (UD) – Italy

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MicroUPS RS232 protocol specification

1. Protocol description + Interface specification

This protocol enables the communication between a master (PC) and a slave (UPS).

The hardware communication protocol is:

- RS232 + no handshaking protocol
- Half Duplex
- baud rate: 1200 bps;
- char length: 8 bit;
- stop bit: 2 (do not use 1 stop bit);
- NO parity.

You can't change the speed or bit parameters.

2. UPS models and firmware versions

There are some differences between the various models and firmware versions: here follows a table with the most important changes:

Model	Firmware version	Note
B-Box Interactive	$0 \leq n \leq 2.1$	- BEND command not available - temperature field void - ratio of turn-off delay: 1:1
B-Box Interactive	$n > 2.1$	- temperature field void - ratio of turn-off delay: 1:2
B-Box Sharing (H)	$0 \leq n < 3.0$	- extended protocol ($I_{out} + V_{out}$) - BEND command not available - temperature field valid
B-Box Sharing (H)	$3.0 \leq n \leq 3.3$	- extended protocol ($I_{out} + V_{out}$) - temperature field valid
B-Box Sharing (H)	$n \geq 4.0$	- standard protocol - $I_{out} \rightarrow$ temperature / NO V_{out} - ratio of turn-off delay: 1:4 ($n \geq 3.0$)

3. Protocol specification

The protocol is binary (characters from 0x00 to 0xff) where the Master (PC) always starts the communication with the slave (UPS). There is no checksum on the data packet sent and received.

3.1 Format of the commands sent to the UPS

The commands have variable length and have the following structure:

Byte	Name	Value	Note
0	CMD		Command sent to the UPS
1÷5	PARAM		[optional] Parameters: the length can be from 0 to 5 byte

The byte sent after CMD is variable and can range from 0 to 5.

The UPS identifies the following commands (CMD):

CMD	Value	Description
POLL	0x30 / '0'	POLLING: asks to the UPS the working parameters (voltage, temp, freq., ...)
TIMER	0x31 / '1'	TIMER CALIBRATION: sets the internal clock of the UPS
SCHED	0x32 / '2'	SCHEDULING: sets the turning ON/OFF parameters of the UPS
STDBY	0x33 / '3'	STAND-BY: switch the UPS in Standby mode
B_END	0x34 / '4'	BATTERY END: sets the UPS in Battery End ¹ mode
B_TEST	0x35 / '5'	BATTERY TEST: switch the UPS in battery mode (≈5 sec.)
BUZZ	0x36 / '6'	BUZZER SILENCING: silence the buzzer
MODEL	0x3A / ':'	UPS MODEL: identifies the UPS model

¹ This following models do not support this command:

- B-Box Interactive: firmware release ≤ 2.1
- B-Box Sharing: firmware release ≤ 3.0

3.1.1 'Polling' command

Byte	Nome	Valore	Note
0	POLL	0x30 / '0'	POLLING: asks to the UPS the working parameters (state, voltages, ...)

This command asks to the UPS the working parameters. Each kind of UPS will send a different data record (grayed out rows mean differences between the various UPSs):

B-Box Interactive firmware versions ≤ 2.1

Byte	Name	Value	Note
0	STRT_F	0x5B / '^'	Frame start character
1	FRID	0x01 / '^A'	Frame ID – always 0x01
2	STAT		UPS status: bit 0: battery mode: 0=OFF / 1=ON bit 1: battery low 0=OFF / 1=ON bit 2: battery discharged 0=OFF / 1=ON bit 3: Stand-By mode 0=OFF / 1=ON bit 4: high temperature 0=OFF / 1=ON bit 5: temperature warning 0=OFF / 1=ON bit 6: mains absence 0=mains ON / 1=mains OFF bit 7: output frequency: 0 = 60Hz / 1 = 50Hz
3	VINP	<i>Vinp</i>	Mains mean input voltage: VINP (V) = $Vinp * 1.692$
4	VBAT	<i>Vbatt</i>	Battery voltage: VBAT (V) = $\frac{Vbatt * n}{16.82}$ where: <i>n</i> = 1 for 300/500 VA UPSs or <i>n</i> = 2 800/1000 VA UPSs
5	TEMP	<i>Temp</i>	Temperature: TEMP (°C) = $(Temp - 51) * 3.005$
6	HOUR_WK	<i>Hour_Wk</i>	UPS internal clock: made by <i>Hour</i> and <i>Day</i> of the week: <i>Hour</i> = <i>Hour_Wk</i> MOD 24 <i>Day</i> = INT(<i>Hour_Wk</i> / 24) Where <i>Day</i> : 0=Monday / 2=Tuesday / ... / 6 = Sunday
7	MIN		UPS internal clock: Minutes
8	SEC		UPS internal clock: Seconds
9	HOUR_ON		UPS Turn ON: Hour
10	MIN_ON		UPS Turn ON: Minutes
11	HOUR_OFF		UPS Turn OFF: Hour
12	DSHTDN	<i>DShtdn</i>	Shutdown delay (seconds): DSHTDN = <i>DShtdn</i>
13	RTL	<i>RtL</i>	Mains frequency (Hz): the formula is: $Fin = \frac{2^{12} * 15}{(255 - RtH) * 256 + (256 - RtL)}$
14	RTH	<i>RtH</i>	
15	END_F	0x5d / '^J'	Frame closing character

B-Box Interactive firmware versions > 2.1

Byte	Name	Value	Note
0	STRT_F	0x5B / '['	Frame start character
1	FRID	0x01 / '^A	Frame ID – always 0x01
2	STAT		UPS status: bit 0: battery mode: 0=OFF / 1=ON bit 1: battery low 0=OFF / 1=ON bit 2: battery discharged 0=OFF / 1=ON bit 3: Stand-By mode 0=OFF / 1=ON bit 4: high temperature 0=OFF / 1=ON bit 5: temperature warning 0=OFF / 1=ON bit 6: mains absence 0=mains ON / 1=mains OFF bit 7: output frequency: 0 = 60Hz / 1 = 50Hz
3	VINP	V_{inp}	Mains mean input voltage: $VINP (V) = V_{inp} * 1.84$
4	VBAT	V_{batt}	Battery voltage: $VBAT (V) = \frac{V_{batt} * n}{16.82}$ where: $n = 1$ for 300/500 VA UPSs or $n = 2$ 800/1000 VA UPSs
5	-	-	Reserved
6	HOUR_WK	$Hour_Wk$	UPS internal clock: made by <i>Hour</i> and <i>Day</i> of the week: $Hour = Hour_Wk \text{ MOD } 24$ $Day = \text{INT}(Hour_Wk / 24)$ where <i>Day</i> : 0=Monday / 2=Tuesday / ... / 6 = Sunday
7	MIN		UPS internal clock: Minutes
8	SEC		UPS internal clock: Seconds
9	HOUR_ON		UPS Turn ON: Hour
10	MIN_ON		UPS Turn ON: Minutes
11	HOUR_OFF		UPS Turn OFF: Hour
12	DSHTDN	$DShtdn$	Shutdown delay (seconds): $DSHTDN = DShtdn * 2$
13	RTL	RtL	Mains frequency (Hz): the formula is: $F_{in} = \frac{2^{12} * 15}{(255 - RtH) * 256 + (256 - RtL)}$
14	RTH	RtH	
15	END_F	0x5d / ']'	Frame closing character

B-Box Sharing (H) firmware versions ≤ 3.3 (extended protocol)

Byte	Name	Valore	Note														
0	STRT_F	0x5B / ' [?	Frame start character														
1	FRID	0x01 / ^A	Frame ID – always 0x01														
2	STAT		UPS status: bit 0: battery mode: 0=OFF / 1=ON bit 1: battery low 0=OFF / 1=ON bit 2: battery discharged 0=OFF / 1=ON bit 3: Stand-By mode 0=OFF / 1=ON bit 4: high temperature 0=OFF / 1=ON bit 5: temperature warning 0=OFF / 1=ON bit 6: mains absence 0=mains ON / 1=mains OFF bit 7: output frequency: 0 = 60Hz / 1 = 50Hz														
3	VINP	<i>Vinp</i>	Mains mean input voltage: $VINP (V) = V_{inp} * 1.84$														
4	VBAT	<i>Vbatt</i>	Battery voltage: $VBAT (V) = \frac{V_{batt} * n}{16.82}$ where: <i>n</i> = 1 for 300/500 VA UPSs or <i>n</i> = 2 800/1000 VA UPSs														
5	TEMP	<i>Temp</i>	Temperature: $TEMP (°C) = (Temp - 51) * 3.005$														
6	HOUR_WK	<i>Ora_Wk</i>	UPS internal clock: made by <i>Hour</i> and <i>Day</i> of the week: $Hour = Hour_Wk \text{ MOD } 24$ $Day = \text{INT}(Hour_Wk / 24)$ where <i>Day</i> : 0=Monday / 2=Tuesday / ... / 6 = Sunday														
7	MIN		UPS internal clock: Minutes														
8	SEC		UPS internal clock: Seconds														
9	HOUR_ON		UPS Turn ON: Hour														
10	MIN_ON		UPS Turn ON: Minutes														
11	HOUR_OFF		UPS Turn OFF: Hour														
12	DSHTDN	<i>DShtdn</i>	Shutdown delay in seconds: IF firmware release ≤ 3.0: $DSHTDN = DShtdn * 2$ IF firmware release > 3.0: $DSHTDN = DShtdn * 4$														
13	RTL	<i>RtL</i>	Mains frequency (Hz): the formula is: $F_{in} = \frac{2^{12} * 15}{(255 - RtH) * 256 + (256 - RtL)}$														
14	RTH	<i>RtH</i>															
15	IOUT	<i>Iout</i>	Output current (%): this value is relative to the UPS capacity (W or V/A). It is calculated using the following table: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><i>Iout</i></th> <th>Load %</th> </tr> </thead> <tbody> <tr> <td>$0 \leq Iout \leq 3$</td> <td>0</td> </tr> <tr> <td>$3 < Iout \leq 10$</td> <td>25</td> </tr> <tr> <td>$10 < Iout \leq 22$</td> <td>50</td> </tr> <tr> <td>$22 < Iout \leq 37$</td> <td>75</td> </tr> <tr> <td>$37 < Iout \leq 47$</td> <td>100</td> </tr> <tr> <td>$Iout > 47$</td> <td>120</td> </tr> </tbody> </table> IF $47 < Iout \leq 155$ for more than 1.5 s, or $Iout > 155$ for more than 480 ms, the UPS will disconnect the load because the UPS is in overload mode.	<i>Iout</i>	Load %	$0 \leq Iout \leq 3$	0	$3 < Iout \leq 10$	25	$10 < Iout \leq 22$	50	$22 < Iout \leq 37$	75	$37 < Iout \leq 47$	100	$Iout > 47$	120
<i>Iout</i>	Load %																
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$10 < Iout \leq 22$	50																
$22 < Iout \leq 37$	75																
$37 < Iout \leq 47$	100																
$Iout > 47$	120																
16	VOUT	<i>Vout</i>	Output voltage: $VOUT = Vout * 1.692$ (with a ±15% error)														
17		0x5d / '] '	Frame closing character														

B-Box Sharing (H) firmware versions > 3.3

Byte	Nome	Valore	Note														
0	STRT_F	0x5B / ']'	Frame start character														
1	FRID	0x01 / ^A	Frame ID – always 0x01														
2	STAT		UPS status: bit 0: battery mode: 0=OFF / 1=ON bit 1: battery low 0=OFF / 1=ON bit 2: battery discharged 0=OFF / 1=ON bit 3: Stand-By mode 0=OFF / 1=ON bit 4: high temperature 0=OFF / 1=ON bit 5: temperature warning 0=OFF / 1=ON bit 6: mains absence 0=mains ON / 1=mains OFF bit 7: output frequency: 0 = 60Hz / 1 = 50Hz														
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6	HOUR_WK	<i>Hour_Wk</i>	UPS internal clock: made by <i>Hour</i> and <i>Day</i> of the week: $Hour = Hour_Wk \text{ MOD } 24$ $Day = \text{INT}(Hour_Wk / 24)$ where <i>Day</i> : 0=Monday / 2=Tuesday / ... / 6 = Sunday														
7	MIN		UPS internal clock: Minutes														
8	SEC		UPS internal clock: Seconds														
9	HOUR_ON		UPS Turn ON: Hour														
10	MIN_ON		UPS Turn ON: Minutes														
11	HOUR_OFF		UPS Turn OFF: Hour														
12	DSHTDN	<i>DShtdn</i>	Shutdown delay in seconds = $DShtdn * 4$														
13	RTL	<i>RtL</i>	Mains frequency (Hz): the formula is: $Fing = \frac{2^{12} * 15}{(255 - RtH) * 256 + (256 - RtL)}$														
14	RTH	<i>RtH</i>															
15	END_F	0x5d / '['	Frame closing character														

3.1.2 'Timer Calibration' command

Byte	Nome	Valore	Note
0	TIMER	0x31 / '1'	TIMER CALIBRATION: sets the internal clock of the UPS
1	HOUR_WK	<i>Hour_Week</i>	<i>Hour</i> and <i>Day</i> of the week; the value follows the rule: $Hour_Week = Hour + 24 * Day$ where <i>Day</i> : 0=Monday / 1=Tuesday / ... / 6 = Sunday
2	MIN	<i>Min</i>	Minutes
3	SEC	<i>Sec</i>	Seconds

This command sets the internal clock of the UPS. The clock is weekly, so on the rollover between Sunday and Monday it will restart at 0:00 and day 0 (Monday).

3.1.3 Scheduling

Byte	Nome	Valore	Note
0	SCHED	0x32 / '2'	SCHEDULING: sets the automatic turn ON/OFF of the UPS
1	HOUR_ON	<i>Hour_On</i>	<i>Hour</i> and <i>Day</i> of the week when the UPS will turn itself ON; the value follows the rule: $Hour_On = Hour + 24 * Day$ where <i>Day</i> : 0=Monday / 1=Tuesday / ... / 6 = Sunday
2	MIN_ON	<i>Min_On</i>	Minutes (when the UPS will turn itself ON)
3	HOUR_OFF	<i>Hour_Off</i>	<i>Hour</i> and <i>Day</i> of the week when the scheduling will end; the value follows the rule: $Hour_Off = Hour + 24 * Day$ where <i>Day</i> : 0=Monday / 1=Tuesday / ... / 6 = Sunday
4	DSHTDN	<i>DShtdn</i>	Delay in seconds after which the UPS will Shutdown (after receiving the Shutdown command (STDBY)) This value depends on the UPS model and its firmware revision: B-Box Interactive ≤ 2.1 DSHTDN (sec) = <i>DShtdn</i> B-Box Interactive > 2.1 DSHTDN (sec) = <i>DShtdn</i> * 2 B-Box Sharing ≤ 3.0 DSHTDN (sec) = <i>DShtdn</i> B-Box Sharing > 3.0 DSHTDN (sec) = <i>DShtdn</i> * 4
5	DAY_WK	<i>Day_Wk</i>	<i>Day_Wk</i> can assume the following values: 0x31 / '1' = Daily Scheduling (UPS don't use <i>weekday</i>) 0x30 / '0' = Weekly Scheduling (UPS use <i>weekday</i>)

Daily scheduling

The UPS is set to turn ON EVERY day at the same time. The variables *Day*, *Day_Wk* and *Hour_Off* will be set to:

$$Day = Hour_Off = 0$$

$$Day_Wk = 0x31 / '1'$$

Daily schedule

Weekly scheduling

The UPS is set to turn ON for *n* consecutive days (of the week).

The first day is set in the variables *Hour_On* and *Min_On*.

The UPS will not turn ON if: $Hour_On > Hour_Off$.

example: Turn ON the UPS at 8:30 in days between Tuesday(1) and Friday(5).

$$Hour_On = 8 + 24 * 1$$

$$Min_On = 30$$

$$Hour_Off = 10 + 24 * 5$$

which is > than 9:00 of Friday (8 + 24 * 5)

$$Day_Wk = 0x30 / '0'$$

weekly scheduling

At the scheduled turn ON, if mains is good present, the UPS will power the load; otherwise, it will switch in the [B_END](#) state, waiting for the mains.

Schedule disabling

To disable the scheduling, send a schedule with the following parameters:

$$Hour_On = Hour_Off = 255$$

$$Min_On = 0$$

It's better to leave the other parameters **equal** to those read using the [POLL](#) command.

3.1.4 Stand-By mode

Byte	Nome	Valore	Note
0	STDBY	0x33 / '3'	STAND-BY: the UPS will switch in the Stand-By mode

The UPS will wait for a DSHDWN time ([SCHED](#)) before switching to Stand-By mode.

3.1.5 B-End (battery end) mode

Byte	Nome	Valore	Note
0	B_END	0x34 / '4'	BATTERY END: the UPS will switch to Battery End mode

The UPS will switch in this state ONLY if it has previously received a Stand-By command. If you want to use this command, you will need to send the two commands: [STDBY](#) + [B_END](#).

This command is NOT available on UPS with the following firmware versions:

B-Box Interactive ≤ 2.1
B-Box Sharing ≤ 3.0

When the UPS will switch in B-End mode, the LEDs will start to blink altogether, waiting for the return of the mains. Only with the return of the mains the UPS will turn ON the load.

3.1.6 Battery Test

Byte	Nome	Valore	Note
0	B_TEST	0x35 / '5'	BATTERY TEST: the UPS will switch to Battery Test mode (≈5 sec.)

At the end of test, UPS model with the following versions of firmware:

B-Box Interactive ≥ 5.0
B-Box Sharing ≥ 4.0

Will send a data packet with *model* and *firmware version* like using the command [MODEL](#).

3.1.7 Buzzer silencing

Byte	Nome	Valore	Note
0	BUZZ	0x36 / '6'	TACITAZIONE BUZZER: The buzzer will be silenced

3.1.7 UPS model

Byte	Nome	Valore	Note
0	MODEL	0x3A / ':'	MODELLO UPS: query of the UPS model

The UPS will answer with an 8 byte packet:

Byte	Nome	Valore	Note
0	STRT_F	0x5B / '['	Frame start character
1	LF	0x0A / '^J	Frame ID – always 0x0A
2÷3	MODEL		UPS model: 2 characters: “B5” = B-Box Interactive firmware ≥ 5.0 “MD” = B-Box Interactive firmware < 5.0 “SH” = B-Box Sharing
4÷6	VER		Firmware version: with format “M.m”, where: M = major version m = minor version
7	END_F	0x5d / ']'	Frame closing character